RADIOGRAPH PICTURE INFORMATION READER

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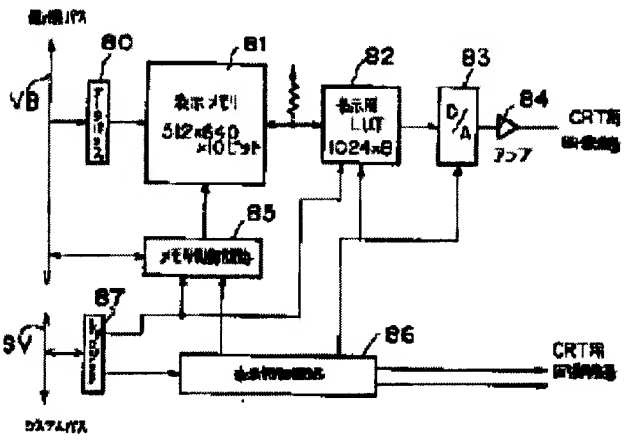
Abstract of **JP10062878**

PROBLEM TO BE SOLVED: To obtain picture data having high instantanity and diagnostic characteristic by using thinned picture data or changing a processing condition in the case of finding a picture processing condition in accordance with a radiation picture after the radiation picture is photographed on a radiation picture converting panel. SOLUTION: The picture data passing through a picture bus VB are successively written in a memory 81 for display through a data buffer 80. The memory 81 is successively transmitted to a look-up table 82 for display, converted, compressed, converted to analog data by a D/A converter 83, further amplified by an amplifier 84 so as to be a video signal for CRT, and given to a CRT display device. Display changes at the point by the rewriting control of the table 82 by a CPU 50. As to the display in the middle of being read; the entire areas of picture data can be observed, so that the deviation of a photographing position and the rough feeling of the picture data can be grasped. Whether re-photographing is required or not can be instantaneously decided.



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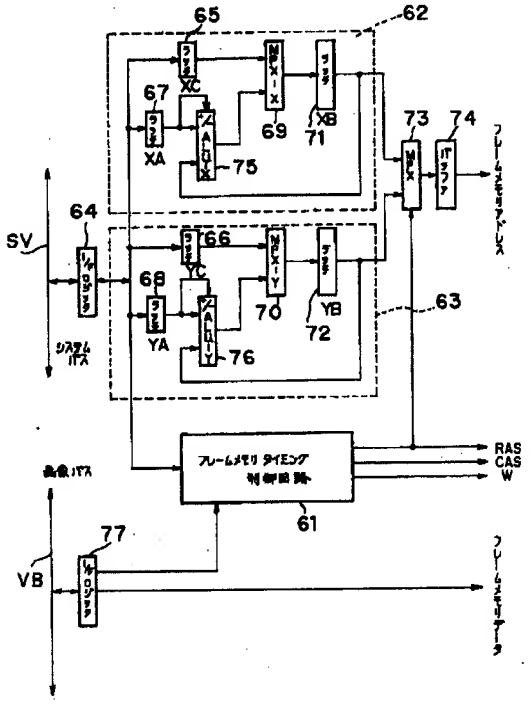
(54)【発明の名称】　放射線画像情報読取装置

(57)【要約】
【課題】　変換パネルに放射線画像を撮影するとほぼ同時に少ないデータ処理で画像の状態を把握できる表示を行ない、読取中及び読取り後の画像データ及び表示状態を変更可能にして診断性の高い画像を表示可能にし、また撮影ミスを救済できるようにした放射線画像情報読取表示装置を提供するにある。
【解決手段】　放射線画像情報を蓄積記録する放射線画像変換パネルに励起光を走査して蓄積記録される前記放射線画像を読取り、この読取り画像データをフレームメモリに記憶及び表示手段に表示する放射線画像情報読取表示装置において、前記読取り画像データを前記フレームメモリに転送するのに並行して該フレームメモリから間引読出しした画像データを前記表示手段に表示し、読取り中及び読取り後に前記表示手段への画像表示状態及び画像データを入力手段により変更できるようにした放射線画像情報読取表示装置。



【特許請求の範囲】
【請求項１】　放射線画像情報を蓄積記録する放射線画像変換パネルに励起光を走査して蓄積記録される前記放射線画像を読取り、この読取り画像データをフレームメモリに記憶及び表示手段に表示する放射線画像情報読取表示装置において、前記読取り画像データを前記フレームメモリに転送するのに並行して該フレームメモリから間引読出しした画像データを前記表示手段に表示し、読取り中及び読取り後に前記表示手段への画像表示状態及び画像データを入力手段により変更できるようにしたことを特徴とする放射線画像情報読取表示装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、輝尽性蛍光体に蓄積記録される放射線画像情報を読取及び表示する放射線画像情報読取装置に関する。
【０００２】
【従来の技術】従来、放射線画像を得るために、Ｘ線写真法が用いられてきた。この方法は、容易に被写体内部に透視画像が得られ、とくに医療における診断分野において、極めて有力な方法として、多く用いられてきた。しかし、この方法は人体中の各組織のＸ線透過率の差が小さく、またＸ線が被写体中で散乱されるために得られる画像のコントラストが小さいこと、Ｘ線が人体にとって有害であること、ラチチュードが狭く、撮影条件が厳しいこと等の欠点があった。これらの欠点を補うために、感度が高くラチチュードの広いＸ線検出器を用いて、Ｘ線画像を電気信号に変換し、画像処理をすることによって、人体に対する影響が少なく、なおかつ高画質の画像を得る方法が探究されてきた。
【０００３】このような放射線写真法の一例として、被写体を透過した放射線をある種の蛍光体に吸収、蓄積させ、しかる後この蛍光体をある種のエネルギーで励起して、この蛍光体が蓄積している放射線エネルギーを蛍光として放射せしめ、この蛍光を検出して画像化する方法が考えられている。具体的な方法として、例えば米国特許３，８５９，５２７号及び特開昭５５－１２１４４号には、蛍光体として輝尽性蛍光体を用い、励起エネルギーとして可視光線及び赤外線から選ばれる電磁放射線を用いる放射線画像変換方法が提唱されている。
【０００４】この方法は、支持体上に輝尽性蛍光体層を形成した放射線画像変換パネルを用い、この放射線画像変換パネルの輝尽性蛍光体層に被写体を透過した放射線を吸収させ、放射線の強弱に対応した放射線エネルギーを蓄積させ、しかる後この輝尽性蛍光体層を輝尽励起光で走査することによって、蓄積された放射線エネルギーを光の信号として取出し、この光の強弱によって画像を得るものである。この最終的な画像は、ハードコピーとして再生してもよいし、ＣＲＴ等の受像管上に再生してもよい。
【０００５】前記輝尽性蛍光体とは、放射線（Ｘ線、α線、β線、γ線、紫外線等）を照射した後、光あるいは熱等のある種のエネルギーで励起すると、この蛍光体中に蓄積されている放射線エネルギーに応じて、輝尽発光を示すような蛍光体をいう。また、ここで輝尽性蛍光体を含有する層を有する放射線画像変換パネルとは、輝尽性蛍光体層面を有する板状（パネル状）、ドラム状あるいは柔軟性のあるフイルム状をなすもの等種々の形態のものを総称（以下単に変換パネルと呼称する）している。
【０００６】前記方法は、従来の銀塩写真を用いる放射線写真システムと比較して、非常に広い放射線露光域にわたって画像を記録し得るという極めて実用的な利点を有している。すなわち、前記変換パネルにおいて放射線露光量と、放射線蓄積後に輝尽励起光によって発光する輝尽発光の強度あるいは光量とは非常に広範囲にわたって比例することが認められており、従って種々の撮影条件により放射線露光量が大幅に変動しても前記輝尽発光の読取りゲインを適当な値に設定して光電変換手段により読取って電気信号に変換し、この電気信号を用いて写真感光材料等の記録材料、ＣＲＴ等の表示装置に可視画像として出力させることによって放射線露光量の変動に影響されない放射線画像を得ることができる。
【０００７】また、この方法によれば、前記変換パネルに蓄積記録された放射線画像を電気信号に変換した後に適当な信号処理を施し、この電気信号を用いて写真感光材料等の記録材料、ＣＲＴ等の表示装置に可視画像として出力させることによって診断適正の優れた放射線画像を得られるという極めて大きな効果も期待できる。
【０００８】
【発明が解決しようとする課題】しかしながら、上述のように撮影条件等の変動による影響をなくし、あるいは診断適正の優れた放射線画像を得るためには、変換パネルに蓄積記録された放射線画像の記録状態、被写体の部位、あるいは単純造影などの撮影方法等の画像情報を観察読影のための可視画像の表示に基いて前記放射線画像に適当な信号処理を施すことが必要不可欠である。
【０００９】このような可視画像の表示に先立って変換パネルに蓄積記録された放射線画像の画像情報を抽出する方法としては、特開昭５５－５０１８０号に開示された方法が知られている。この方法は変換パネルに放射線を照射した際に前記変換パネルから発する瞬時発光の光強度あるいは光量が変換パネルに蓄積記録される放射線エネルギーに比例するという知見に基き、前記瞬時発光を検出することによって放射線画像の画像情報を抽出し、この情報に基いて適当な信号処理を施し、診断適正に優れた放射線画像を得ようとするものである。この方法によれば、前記放射線画像に適用な信号処理を施すことが可能であり、撮影条件の変動等の影響を無くし、また診断適正の優れた放射線画像を得ることができるが、

一般的に放射線照射部は複数部材群に分かれて構成されており、しかも放射線照射部所と放射線画像読取部所とは位置的に離れているのが通常であるので、その間に信号伝送系を構成しなければならず、装置的に複雑になり、コストの上昇を避けるけることができないという欠点があった。

【００１０】また、特開昭５５－１１６３４０号には、非輝尽性蛍光体を変換パネルの近傍に設け、放射線画像の記録時に前記非輝尽性蛍光体が発する発光を光検出器で検出して変換パネルに記録されている放射線画像の画像情報を抽出する方法が開示されている。しかし、この方法は前記特開昭５５－５０１８０号に開示される方法の欠点に加えて、輝尽性蛍光体それ自体を抽出手段の対象として用いるのではないから画像情報を間接的に推定するということにとどまり、こうして得られた情報に対する信頼性が低いという欠点があった。

【００１１】さらに、可視画像の表示に先立って変換パネルに記録されている放射線画像の画像情報を抽出する方法としては、特開昭５８－６７２４０号に開示された方法も知られている。この方法は観察読影のための可視画像を得る読取操作（以下、本読みという）に先立って、該操作において用いられる輝尽励起光のエネルギーよりも低いエネルギーの輝尽励起光を用いて前記変換パネルに記録されている放射線画像の画像情報を抽出するための読取操作（以下、先読みという）を行ない、この情報に基いて適当な信号処理を施し、診断適正に優れた放射線画像を得ようとするものである。

【００１２】しかしながら、この方法は先読みにおける輝尽励起光エネルギーと本読みにおけるそれとが１に近ければ近いほど、本読みの際に残存蓄積されている放射線エネルギー量は少なくなってしまうため、先読みにおける輝尽励起光エネルギーを本読みにおけるそれより低くする必要があり、そのためには先読みにおける輝尽励起光のスポット系を大きくする、輝尽励起光強度を低下させる、輝尽励起光の走査速度を大とする、あるいは変換パネルの移動速度を大とするなどの手段を講じなければならず、放射線画像読取装置の構造が著しく複雑となる欠点があった。

【００１３】また、この方法においては、前記のような理由により、さき読みにおける輝尽励起光エネルギーを本読におけるそれよりも著しく低くする必要があり、先読によって生ずる輝尽発光は非常に微弱なものである。このため、先読みによって前記画像情報を十分高い精度で抽出することが困難であったり、前記画像情報を十分高い精度で抽出するためには、先読みにおける輝尽発光検出系の検出能を著しく向上させなければならない等の欠点があった。

【００１４】さらに、この方法においては、先読みにおける輝尽励起光エネルギーを本読みにおけるそれよりも十分低くしたとしても、蓄積されている放射線エネルギー散逸は避けにくく、結果的に先読みによって本読みの際に放出される輝尽発光強度あるいは光量は減少し、システム感度が低下するという重大な欠点があった。

【００１５】一方、前記方法とは全く考え方の異なる方法も知られている。この方法は変換パネルに蓄積記録されている放射線画像を読みとって画像記憶装置に一時記憶させた後、前記画像記憶装置に記憶されている放射線画像信号を演算処理することによって前記放射線画像の画像情報を抽出し、この情報に基いて適当な信号処理を施し、診断適正に優れた放射線画像を得ようとするものである。しかし、この方法は放射線画像を一旦画像記憶装置に記憶させ、さらに演算処理する必要があるため、演算処理に長い時間を要し放射線画像の読取から表示までに時間がかかり、リアルタイム性に乏しいという重大な欠点を有していた。

【００１６】また、特開昭６２－９７５３３号に開示されるように、画像の読取から記憶するまでの間に画像の状態を把握するための画像抽出手段を設け、リアルタイム性を向上させる方法も開示されている。

【００１７】この方式は、実画像データを使用し、かつリアルタイム処理が可能となるもので、極めて精度の高い方式になる。しかし、画像データの読取に同期して処理するという高速性が要求されると共に、画像データは最大５００万画素にも及ぶため、ヒストグラムを作成するという単純処理を行なうだけでも２３ビットの演算精度が要求されるため、通常のマイクロコンピュータを使用することができず、専用ハードウェアが必要となる。また、表示画像の状態の良否を判定するにもその表示処理の遅れが撮影の良否の判定を遅らせ、撮影ミス等において再撮影するにも撮影手間を多くする。

【００１８】本発明の目的は、変換パネルに放射線画像を撮影するとほぼ同時に少ないデータ処理で画像の状態を把握できる表示を行ない、読取中及び読取り後の画像データ及び表示状態を変更可能にして診断性の高い画像を表示可能にし、また撮影ミスを救済できるようにした放射線画像情報読取表示装置を提供するにある。

【００１９】

【課題を解決するための手段】上記目的を達成するため、本発明は、放射線画像情報を蓄積記録する放射線画像変換パネルに励起光を走査して蓄積記録される前記放射線画像を読取り、この読取り画像データをフレームメモリに記憶及び表示手段に表示する放射線画像情報読取表示装置において、前記読取り画像データを前記フレームメモリに転送するのに並行して該フレームメモリから間引読出しした画像データを前記表示手段に表示し、読取り中及び読取り後に前記表示手段への画像表示状態及び画像データを入力手段により変更できるようにした放射線画像情報読取表示装置を提案するものである。

【００２０】

【実施例】以下、図面を参照して本発明の実施例を詳細

に説明する。図3は、本発明に係る放射線画像撮影装置のブロック図で、胸部放射線撮影装置の場合で示す。放射線源２１からの放射線が被写体２２の胸部位を通して放射線変換パネル２３に照射される。放射線変換パネル２３は放射線画像情報記録読取部２４の前面に装着され、放射線画像情報記録読取部２４内には、半導体レーザを用いた光ビーム部４１（これはガスレーザ、固体レーザでも良い）、光ビーム部４１からの光ビームを放射線変換パネル２３に照射すると共に走査させる光走査器４２、放射線変換パネル２３の発する輝尽発光光を検出する光電変換器４３を備える。光電変換器４３は、光ファイバからなる集光体４３ａと輝尽発光波長領域の光のみを通過させるフイルタ４３ｂとフイルタ４３ｂを通した光を電気信号に変換するフォトマル４３ｃで構成される。次に、放射線画像情報記録読取部２４内には、光電変換器４３からの出力電流を電圧信号に変換する電流－電圧変換器４４と、電流－電圧変換器４４の電圧信号を対数的に増幅する対数増幅器４５と、増幅器４５の出力をディジタルデータに変換するＡ／Ｄ変換器４６を備える。

【００２１】Ａ／Ｄ変換器４６は、放射線変換パネル２３が持つ広いダイナミックレンジの画像を極力忠実に変換するために輝尽発光光３桁の範囲を１０ビットの変換データとして得る。さらに、放射線画像情報記録読取部２４内には、Ａ／Ｄ変換器４６からのデータを入力する制御回路４７を備え、この制御回路４７は光ビーム部４１の光りビーム強度調整、フォトマル用高圧電源４８の電源電圧調整によるフォトマルのゲイン調整、電流－電圧変換器４４とＡ／Ｄ変換器４６の利得調整及びＡ／Ｄ変換器４６の入力ダイナミックレンジ調整を行うと共に、放射線画像情報の読取ゲインを総合的に調整する。

【００２２】次に、コントロール部２５は、コンピュータ制御装置にされ、中央処理装置（以下ＣＰＵと呼称する）５０にはシステムバスＳＢと画像バスＶＢとで以下の処理要素と結合される。画像表示手段（画像モニタ）画像表示手段５１は表示制御部５１ａとシステムバスＳＢを介してＣＰＵ５０に結合され、記憶手段としてのフレームメモリ５２はフレームメモリ制御部５２ａとシステムバスＳＢを介してＣＰＵ５０に結合される。情報入力手段５３はキーボード５３ａ及びＬＣＤ表示手段５３ｂからなり、インターフェイス５３ｃを介してＣＰＵ５０に結合される。読取用同期手段５４は、ＣＰＵ５０に結合される読取制御部５４ａと、この読取制御部５４ａに結合されるＸ線アダプタ５４ｂからなり、放射線源１の駆動回路１０と、制御回路４７とに結合される。５６は図示しない外部機器に対するＩ／Ｏインターフェース、５７は磁気ディスク装置５８（或は外部の光りディスク装置、磁気テープ装置）に対する磁気ディスク制御部、５９はメモリである。尚、ＣＰＵ５０は外部端末にも結合可能とされる。

【００２３】このような装置の動作は以下に説明する。Ｘ線撮影される被写体２２の識別情報は、コントロール部２５のキーボード５３ａから入力される。この識別情報としては、ＩＤ番号、氏名、生年月日、性別、撮影部位、撮影日時等がある。ただし、撮影日時は、ＣＰＵ５０内に内蔵されているカレンダ・クロックにより自動的に挿入されるようにしてもよいし、外部機器でＩＤ情報を管理している場合はそれかれ送ってもらい照合のみ行うようにしてもよい。また、外部端末で入力されたものを受信して照合のみを行っても良い。また、ここで入力される識別情報は、その時点で撮影される患者に関するものだけでも良いし、一連の情報を予め入力しておいて、後に順に撮影を行っても良い。識別情報が入力され、被写体２２を撮影位置にセットして撮影を行う。撮影ボタンが押されると、ＣＰＵ５０は読取制御部５４ａに読取開始を指示する。読取制御部５４ａはＸ線アダプタ５４ｂを経由して駆動回路１０を制御し、放射線源２１に対してＸ線撮影を指示する。放射線源２１は、これによって被写体２２に向けて放射線（Ｘ線）を照射する。この放射線は被写体２２を透過し、放射線変換パネル２３の輝尽性蛍光体層に被写体２２の放射線透過率分布に従ったエネルギーが蓄積され、そこに被写体２２の潜像が形成される。以上により、Ｘ線撮影が終了する。

【００２４】Ｘ線撮影が終了すると、光ビーム部４１はビーム強度が制御された光ビームを発生し、その光ビームは光走査器４２で変更され、反射鏡で光路が変更されて放射線変換パネル２３に励起走査光として導かれる。放射線変換パネル２３は励起走査光によって、その潜像エネルギーに比例した輝尽発光光を出力する。光電変換器４３は、この輝尽発光光を検出し、入射光に対応した電流信号を出力する。この出力電流は、電流－電圧変換器４４、増幅器４５、Ａ／Ｄ変換器４６を経て、ディジタル画像データとなり、制御回路４７に印加され、コントロール部２５に転送される。

【００２５】図4はコントロール部２５における読取制御部５４ａの構成ブロック図である。この読取制御部５４ａは、互いに同期して切換えられる入力スイッチＳＷ１、出力スイッチＳＷ２と、２０４８画素分の記憶容量のＲＡＭからなるラインバッファＡ、Ｂで構成される。ここで、ラインバッファＡ、Ｂは画像データの主走査方向の１ラインに相当している。放射線画像情報記録読取部２４からの１ライン目の画像データがラインバッファＡに記憶されると、入力スイッチＳＷ１、出力スイッチＳＷ２が切換えられ、２ライン目の画像データがラインバッファＢに記憶される。これと同時にラインバッファＡの１ライン目の画像データは出力され、画像バスＶＢを通して、フレームメモリ５２に順次記憶されていく。１ライン毎に入力／出力スイッチＳＷ１、ＳＷ２は切換えられてラインバッファＡ／Ｂは役割を交代していく。

【００２６】図5は、フレームメモリ５２の構成概略図

である。このフレームメモリ５２は、２０４８＊２５６０画素分の記憶容量を持つＲＡＭで構成されている。放射線画像情報記録読取部２４で変換され、ラインバッファＡ／Ｂで一時記憶された画像データは、フレームメモリ５２に１ラインづつ記憶されていく。これと同時に記憶された画像データは画像バスＶＢを経由して、表示制御部５１ａに転送されたり磁気ディスク制御部５７に転送される。

【００２７】フレームメモリ５２から表示制御部５１ａに画像データを転送するときは、フレームメモリ５２から主走査、副走査方向共に４画素おきに読出し、表示制御部５１ａ内の表示メモリには連続して書込んでいく。これは、表示用ＣＲＴが５１２画素＊６４０画素の表示解像力しか持たないので、主副共に１／４に間引くためのものである。また、フレームメモリ５２から磁気ディスク制御部５７に画像データを転送するときは、フレームメモリ５２から連続して読出し、磁気ディスク制御部５７内のＦＩＦＯメモリに連続して書込んでいく。このように、間引いたり、連続したりしてフレームメモリ５２をアクセス可能にするために、フレームメモリ制御部５２ａは図１に示す構成としている。

【００２８】同図において、基本的には、フレームメモリタイミング制御回路６１内で全体的なフレームメモリ５２の読み書きタイミングが生成され、Ｘ軸方向の主走査方向アドレスジェネレータ６２とＹ軸方向の副走査方向アドレスジェネレータ６３とでアクセスすべきフレームメモリ５２の番地が指定され、データは画像バスＶＢを経由して読出し、又は、と書込みがなされる。主走査方向アドレスジェネレータ６２は２０４８画素分に対応させた１１ビット、副走査方向アドレスジェネレータ６３は２５６０画素分に対応させた１２ビットで構成されるほかは同一の構成になる。

【００２９】ここでは、４画素おきに読出す場合で説明する。まず、ＣＰＵ５０は先頭の画素位置のアドレスをＩ／Ｆロジック６４を通してラッチ回路６５とラッチ回路６６にセットする。次に、ＣＰＵ５０はアドレスの増分である＋４をラッチ回路６７とラッチ回路６８にセットする。そして、ＣＰＵ５０はフレームメモリタイミング制御回路６１内のコマンドラッチの読出しフラグとＸ方向加算フラグをセットし、データ転送の開始を指令する。

【００３０】この指令で、フレームメモリタイミング制御回路６１は、まずラッチ回路６５とラッチ回路６６の先頭の画素位置データをマルチプレクサ６９と７０を通してラッチ回路７１とラッチ回路７２にセットし、これらラッチデータをマルチプレクサ７３で切り替え、バッファ７４を通してフレームメモリアドレスを発生させる。このフレームメモリアドレスによる先頭の画素データが読出されると、フレームメモリタイミング制御回路６１はマルチプレクサ６９を加減算器７５側に切換える。加減算器７５はラッチ回路６７とラッチ回路７１のラッチデータの加減算を行い、フレームメモリタイミング制御回路６１からのタイミング信号毎にラッチ回路７１の現在値にラッチ回路６７の増分＋４を加算した画素位置データを該ラッチ回路７１にセットする。この制御により、フレームメモリタイミング制御回路６１は1つの画素データが転送される毎に主走査方向アドレスジェネレータ６２の＋４増分制御を行う。

【００３１】１ラインの転送終了時は１ラインの転送終了毎に副走査方向アドレスジェネレータ６３を、上記走査方向アドレスジェネレータ６２の操作と同様に行ない＋４増分制御を行う。また、フレームメモリタイミング制御回路６１は、１つの画素を読出すごとにＤＲＡＭのフレームメモリ５２に対してＲＡＳ、ＣＡＳ信号を与え、またリフレッシュ動作も制御する。上述のような制御により、撮影画像を１／４に間引きした画像データを得ることができる。

【００３２】間引き率を変更するときはラッチ回路６７及びラッチ回路６８への設定値を変更することで成される。たとえば、ラッチ回路６７及びラッチ回路６８への設定値が＋１のとき、連続アクセスとなるし、ラッチ回路６７への設定値が－１でラッチ回路６８への設定値が＋１のときには左右反転画像を読出すことができる。

【００３３】フレームメモリ５２から読出された画像データは、Ｉ／Ｆロジック７７及び画像バスＶＢを介して転送されるが、ＣＰＵ５０では１ラインづつ転送管理しており、表示制御部５１ａへ転送中に磁気ディスク制御部５７への転送が必要になると該ラインの転送終了時に該時点のアドレスをストアし、磁気ディスク制御部５７へ転送すべきフレームメモリのアドレスや増分値、コマンドを設定して転送を行う。そして、転送終了時点でストアしていたアドレスや増分、コマンド等を再設定して表示制御部５１ａへの転送を再開する。これは、ラッチやレジスタへの設定におけるオーバヘッドが存在し、実効速度を低下させるが、画像転送に比べて極めて頻度が少なく、見掛け上並列動作を可能にする。

【００３４】また、読取動作中は、放射線画像情報記録読取部２４の制御回路４７からフレームメモリ５２へ、フレームメモリ５２から表示制御部５１ａへ又は磁気ディスク制御部５７へという転送を上述の用に並列的に行うが、読取終了とほぼ同時に画像表示手段５１への表示と磁気ディスク装置５８へのデータ保管がなされる。

【００３５】そして、読取終了時、ＣＰＵ５０はラッチ回路６５及びラッチ回路６６に先頭アドレスを設定し、ラッチ回路６７及びラッチ回路６８に＋３２を設定して磁気ディスク制御部５７内のバッファメモリに転送を行う。このときの画素数は６４＊６４画素の計４０９６画素になる。これは、主副走査共に１／３２に画素間引きを行い、かつ画像を正方形にトリミングした形になる。ＣＰＵ５０はこの画像データを用い、画像の累積頻度分

布を求め、画像の最適な表示特性である画像処理条件を求め、表示制御部５１ａ内の表示用ルックアップテーブルの内容を変更する。このように、主副走査共に１／３２に間引き（画素数は１／１０２４）するも、画像の持つ最大値、最小値、中央値などの特徴量や累積頻度分布はオリジナルの画像データと殆ど変化は起きないことを本発明者は見い出し、この現象を利用することで演算を極めて簡単化し、１６ビットのマイクロプロセッサでも画像の最適な表示特性を得るのに殆ど時間遅れなく判定できるようにしている。図６（Ａ）乃至図９（Ｈ）は各間引き率における累積頻度分布と頻度分布特性を例示する。本例でもわかるとおり、オリジナルな画像データの累積頻度分布（図６（Ａ））と比較しても、３２画素毎に間引いた累積頻度分布（図８（Ｆ））はほとんど同一の形状をしており、これを用いて画像状態を推定しても問題ない。また、これ以上の間引き率の画像を用いても（図９（Ｇ）、（Ｈ））、その推定は、あまり狂わないので、ハード的にも、処理時間的にも効果がある。

【００３６】そして、図７（Ｄ）、図８（Ｅ）程度であれば、１６ビットのＣＰＵを使用してもさほど大きな処理時間とはならず、オリジナル画像データを使用して推定するのと遜色ない処理を行うことが可能で、効果的である。

【００３７】なお、Ｘ線画像は、画像周辺部の情報が全体に対して影響が低く、画像の抽出領域として上部及び下部を省いて抽出してもその特徴を損なうことは少ない。このような場合の中央部のみの読取制御や、読取画像が２０４８＊２５６０画素よりも相当小さくなるときには間引き率を３１，３０，・・・と小さくして画像領域の範囲内で読取を行うなど読取領域と間引き率の適宜調整をラッチデータの変更で容易に行うことができる。

【００３８】例として、主走査２０４８画素、副走査２４６４画素の画像を読取る場合、上部及び下部を夫々２０８ラインづつ省いた２０４８＊２０４８画素の画像を１／３２の画素間引きで６４＊６４画素の抽出データを得ることができる。これは読取が終了する２００ライン以上前に抽出が完了し、その後に累積頻度分布を計算し、最大値、最小値、中央値等を算出し、画像処理条件であるその画像に最適な特性を持つルックアップテーブルデータを作成するも、読取終了前に全ての演算を終了させることができる。このことは、表示制御部５１ａ内の表示用ルックアップテーブルを変更すれば、読取終了とほぼ同時に最適な表示特性でＣＲＴ画像の観察を可能にすることを意味する。

【００３９】図２は表示制御部５１ａのブロック図を示す。画像バスＶＢを通した画像データはデータバッファ８０を通して順次表示用メモリ８１に書込まれる。この表示用メモリ８１は１０ビットデータを５１２＊６４０画素分の記憶容量を持つ。表示用メモリ８１の記憶データは、１０ビット（１０２４レベル）のデータを８ビットに変換する表示用ルックアップテーブル８２に順次転送されて８ビットのデータに変換圧縮され、このデータはＤ／Ａ変換器８３でアナログデータに変換され、さらにアンプ８４で増幅されてＣＲＴ用映像信号化されてＣＲＴ表示器に与えられる。表示用メモリ８１はメモリ制御回路８５による書込み読出し制御がなされ、またデータ転送制御や同期信号の生成など全体の表示制御が表示制御回路８６によってなされる。これら制御の為の指令は、ＣＰＵ５０からシステムバスＳＢ及びＩ／Ｆロジック８７を通して与えらえる。

【００４０】このような構成の表示制御を以下に説明する。ＣＰＵ５０による表示用ルックアップテーブル８２の書き替え制御により、表示はその時点で変化していく。そこで、ＣＰＵ５０は、撮影開始時に表示制御回路８６に消去指令を与えることでそれまで表示されていた画像を消去する。これは、表示用メモリ８１としてデュアルポートＲＡＭを使用し、読出しポート側から黒データを書込むことにより１フレーム表示時間で終了できる。ここで、表示用メモリ８１を消去する際に、表示用ルックアップテーブル８２には線形なテーブルデータを書込む。これは、読取中の表示には画像データの全域を観察可能にすることにより、撮影位置のずれや画像データのおおよその感じを捕えることを可能にする。例えば、放射線画像情報記録読取部２４ではＸ線量の３桁の範囲を１０ビットに量子化してディジタル画像データを得るが、実際に有効な範囲は１．５桁程度であり、画像データが１０ビット（０～１０２３）のレベルのどの当りに存在するかをＣＲＴで観察できるようにする。この観察から撮影条件の設定ミスにより画像が白や黒レベル近くに位置していないかを確認可能にするし、再撮影を必要とするか否かを即時に判定できるようにする。

【００４１】ＣＲＴの表示画像は、抽出画像データを画像処理条件により処理することにより読取終了とほぼ同時に適切な階調を持つ画像に変り、診断性の良い画像にされる。このとき、撮影の照射野や撮影条件が通常と大きく異なる場合、予め設定する階調特性では十分満足される画像とならない場合がある。この場合にはキーボード５３ａの階調制御用ファンクションキーを走査することで階調を変えることで対応できる。即ち、Ｘ線画像は画像の濃度とその傾きであるガンマ値が重要であるので、その２つのパラメータを画像処理条件である表示用ルックアップテーブル８２で変化させることによりディジタル的に画像処理条件を修正する。以上までのことから、撮影後に即座に画像確認を可能にし、しかも所望の階調性を持つ画像を観察可能にする。

【００４２】また、画像の観察を細部にまで行うときには、キーボード５３ａの拡大とパニング用ファンクションキーにより、画像の拡大やパニングを行うことも可能になる。画像の拡大は、間引き率を減らしてフレームメモリから表示用メモリ８１に転送することで可能である

し、パニングは画像を移動させる量だけ表示用メモリ８１の読出し開始アドレスをずらし、ＣＲＴに新しく表われる分の画像のみを転送することで実現される。この制御を可能にするためには、表示用メモリ８１は主走査方向、副走査方向共にエンドレスとなるように構成される。

【００４３】さらに、撮影方法により、画像が左右反転しているとき、左右反転用ファンクションキーにより画像の左右反転を行うことで修正できる。また、被写体名や生年月日等に入力ミスがあった場合、キーボードによる修正が可能となる。上述のような確認作業が終了したときに次の撮影に移るが、この時点で全てのデータは確定し、外部機器への転送が可能となる。また、次の撮影がなくて、オペレータが操作をしなくなった一定時間経過後、自動的にデータを確定させることで外部機器への自動転送を可能にすることもできる。

【００４４】上述の外部機器は、上位のホストコンピュータの場合もあるし、画像を記録するフイルムプリンタの場合、さらに両方にすることでも良い。このうち、ホストコンピュータにする場合、画像データを複数ラインづつ１ブロックとし、磁気ディスク制御部５７から読出しては画像バスＶＢを経由して外部機器用インターフェイス中のバッファメモリに転送し、ホストコンピュータへ転送する事で実現される。また、フイルムプリンタの場合、ＣＰＵ５０はまずインターフェース中のルックアップテーブルを設定し、ＣＲＴで観察した画像に類似させる。そして、画像転送を行い、プリントさせる。すなわち、ＣＲＴは、出力され画像記録される画像に対応した画像を表示できる構成となっている。

【００４５】なお、外部機器は、ホストコンピュータにしてもフイルムプリンタにしても高速処理装置になるのに対して、磁気ディスク装置５８から画像データを読出しながら転送するのでは実行速度を大きく低下させてしまうか、または転送が間に合わない場合もある。この問題には、フレームメモリ５２を更に１画面分増設し、読取用と転送用に切換使用することで実行速度の向上を図ることができる。また、外部機器へ転送終了した画像については磁気ディスク装置５８の管理情報を削除し、該磁気ディスク装置５８がオーバフローするのを防ぐことができる。

【００４６】

【発明の効果】以上のとおり、本発明は読取り画像データをフレームメモリに転送するのに並行して該フレームメモリから読出しした画像データを表示手段に表示し、読取り中及び読取り後に表示手段への画像表示状態及び画像データを入力手段により変更できるようにしたため、画像データの読取りとほぼ同時の画像表示でその良否を速やかに確認でき、読取り中及び読取り後に表示画像及び画像データの変更によって撮影ミス等においても画像データの変更で再撮影を不要にするし、また診断性の良い画像データへの変更を容易にする効果がある。

【図面の簡単な説明】

【図１】本発明におけるフレームメモリの制御回路図である。

【図２】本発明における表示制御回路図である。

【図３】放射線画像情報読取装置の装置構成図である。

【図４】コントロール部におけるタイミング制御のブロック図である。

【図５】フレームメモリの構成概略図である。

【図６】（Ａ），（Ｂ）は画像データの間引率に対するヒストグラムの変化を示す測定図である。

【図７】（Ｃ），（Ｄ）は画像データの間引率に対するヒストグラムの変化を示す測定図である。

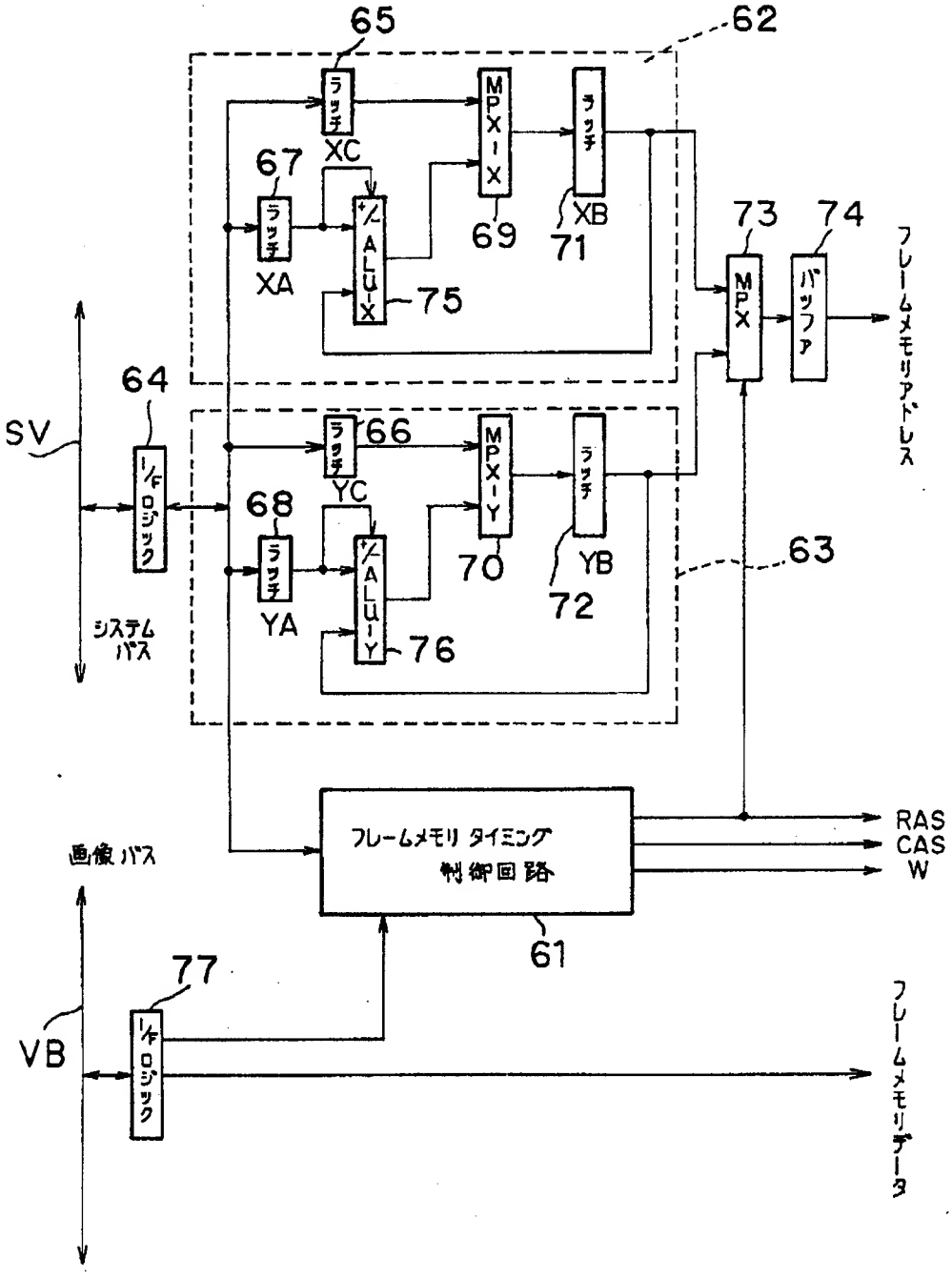
【図８】（Ｅ），（Ｆ）は画像データの間引率に対するヒストグラムの変化を示す測定図である。

【図９】（Ｇ），（Ｈ）は画像データの間引率に対するヒストグラムの変化を示す測定図である。

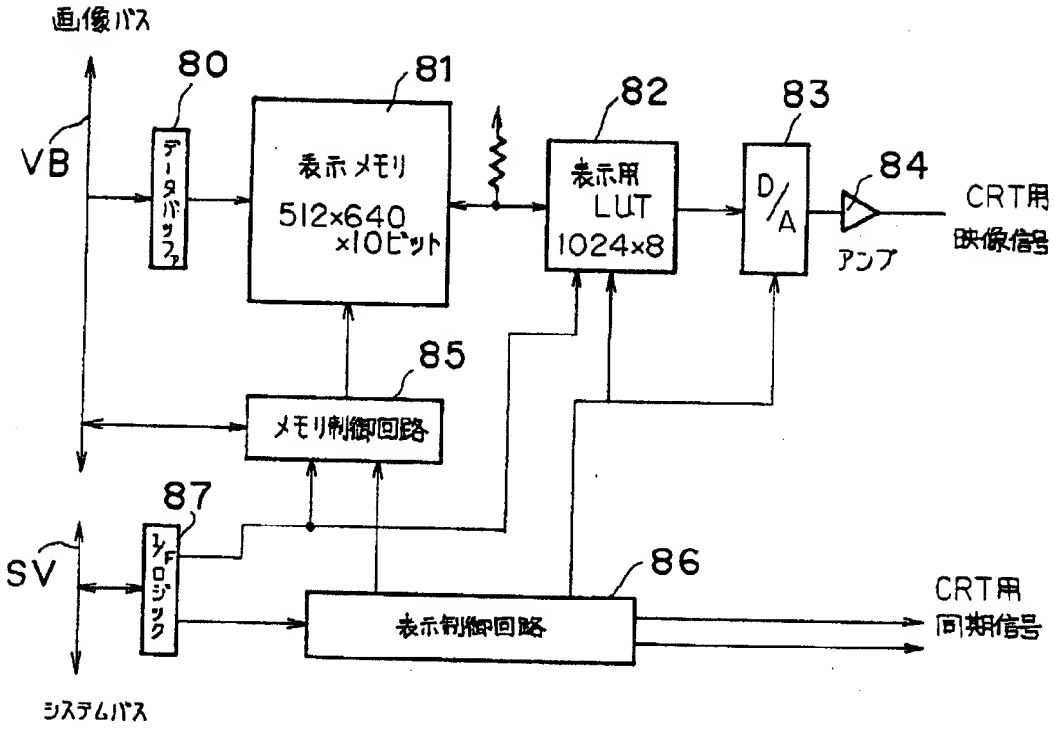
【符号の説明】

２１　放射線源
２２　被写体
２３　変換パネル
２４　放射線画像情報記録読取部
２５　コントロール部
５１ａ　表示制御部
５２　フレー　ムメモリ
５２ａ　フレームメモリ制御部
６１　フレームメモリタイミング制御回路
６２　主走査方向アドレスジェネレータ
６３　副走査方向アドレスジェネレータ
８１　表示用メモリ
８２　表示用ルックアップテーブル

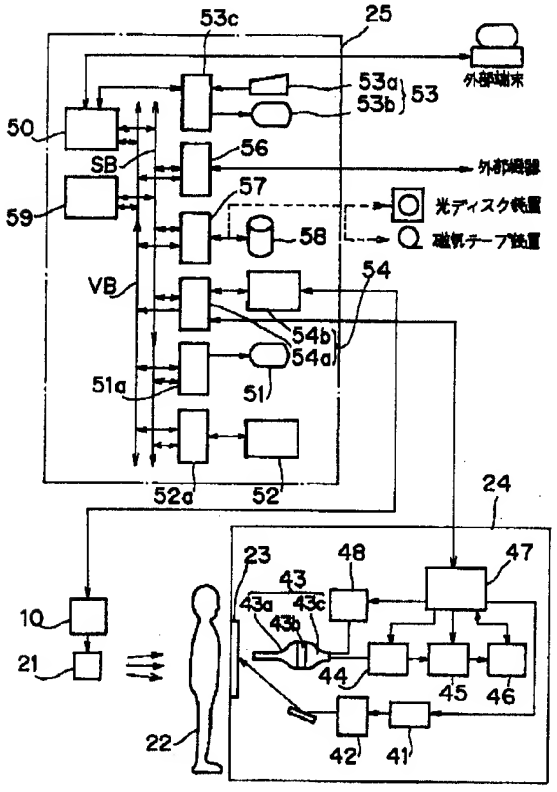
【図1】


65
62
ラッチ
XC
MPX-X
ラッチ
67
ラッチ
XA
+/-ALU-X
69
XB
71
73
74
MPX
バッファ
フレームメモリアドレス
64
SV
I/Fロジック
ラッチ
66
YC
MPX-Y
ラッチ
68
ラッチ
YA
+/-ALU-Y
70
YB
72
63
システムバス
76
フレームメモリ タイミング
制御回路
RAS
CAS
W
画像バス
61
77
VB
I/Fロジック
フレームメモリデータ

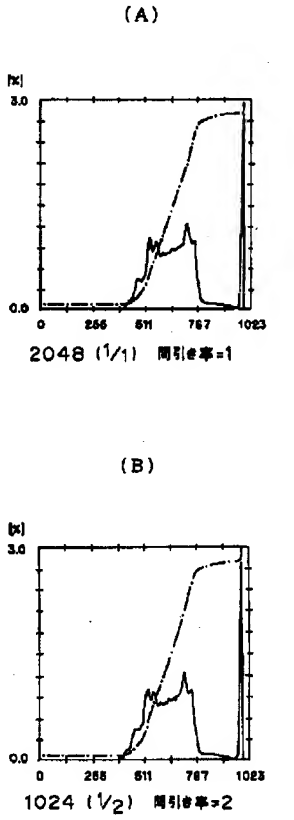
【図2】


画像バス
VB
80
データバッファ
81
表示メモリ
512×640
×10ビット
82
表示用
LUT
1024×8
83
D/A
84
アンプ
CRT用
映像信号
85
メモリ制御回路
87
I/Fロジック
SV
86
表示制御回路
CRT用
同期信号
システムバス

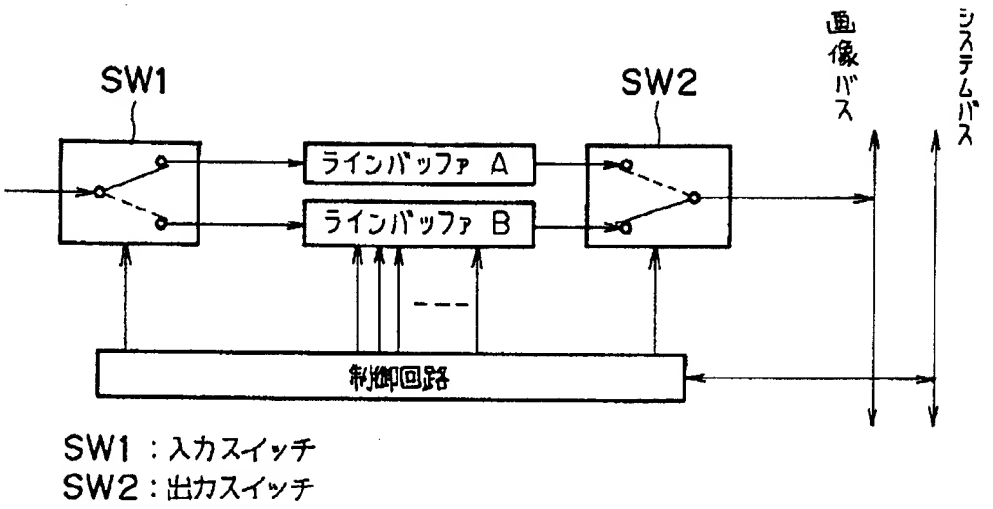
【図3】


53c
25
外部端末
53a
53b
53
50
SB
56
外部機器
59
57
光ディスク装置
58
磁気テープ装置
VB
54
54b
54a
51a
51
52a
52
24
23
48
47
43
43a
43c
43b
10
21
44
45
46
22
42
41

【図6】

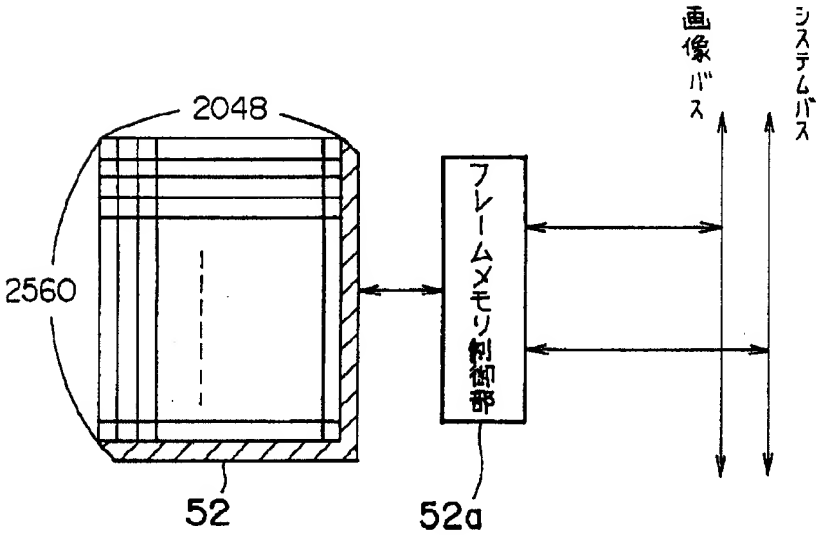

(A)
[x]
3.0
0.0
0
256
511
767
1023
2048 (1/1) 間引き率=1
(B)
[x]
3.0
0.0
0
256
511
767
1023
1024 (1/2) 間引き率=2

【図4】

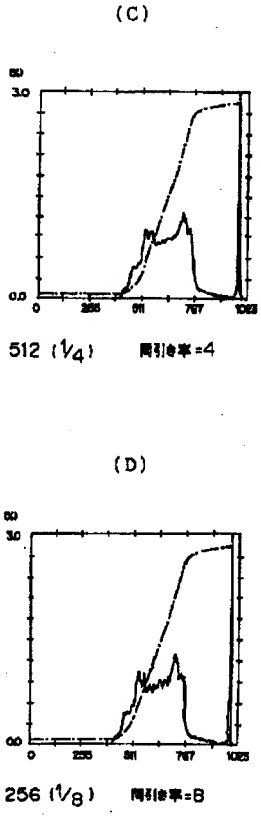


SW1：入力スイッチ
SW2：出力スイッチ

【図5】

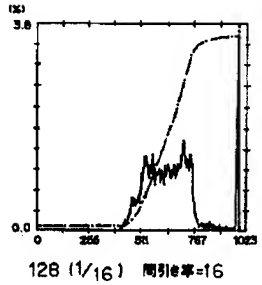


【図7】

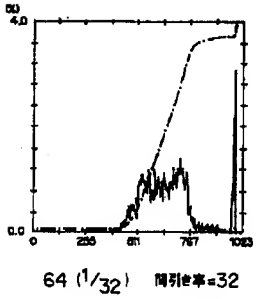


【図8】

（E）

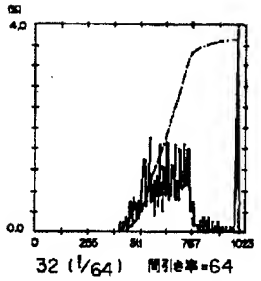


（F）

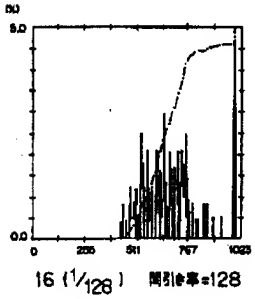


【図9】

（G）



（H）



【手続補正書】
【提出日】平成９年６月２５日
【手続補正１】
【補正対象書類名】明細書
【補正対象項目名】特許請求の範囲
【補正方法】変更
【補正内容】
【特許請求の範囲】
【請求項１】　放射線画像が記録された放射線画像変換パネルを読み取って画像データを得る放射線画像情報読取装置であって、
放射線画像が記録された放射線画像変換パネルを読み取って画像データを得る読取手段と、
外部端末から入力された被写体情報を受信する受信手段と、
前記受信手段で受信した被写体情報と被写体とを照合する照合手段とを有し、
前記被写体情報と被写体との照合を完了した後に、前記被写体の放射線画像が記録された放射線画像変換パネルを読み取って画像データを得るように構成したことを特徴とする放射線画像情報読取装置。

【請求項２】　放射線画像が記録された放射線画像変換パネルを読み取って画像データを得る放射線画像情報読取手段と、
前記放射線画像の読み取りに応じて前記画像データに基づく画像を表示する表示手段と、
前記画像データの特徴量から前記放射線画像に応じた画像処理条件を求める手段と、
前記表示手段に表示される画像を前記処理条件に基づいて変更する変更手段と、
前記画像処理条件を修正する手段と、を有する放射線画像情報読取表示装置。
【請求項３】　放射線画像が記録された放射線画像変換パネルを読み取って画像データを得、該画像データに画像処理を施す放射線画像情報読取装置であって、
放射線画像が記録された放射線画像変換パネルを読み取って画像データを得る読取手段と、
前記画像データを間引いて間引き画像データを取得する手段と、
前記間引き画像データに基づいて前記放射線画像に応じた画像処理条件を求める手段と、

前記画像データを前記画像処理条件に基づいて処理する画像処理手段と、を有する放射線画像情報読取表示装置。

【手続補正２】
【補正対象書類名】明細書
【補正対象項目名】００１８
【補正方法】変更
【補正内容】
【００１８】本発明の目的は、放射線画像変換パネルに放射線画像を撮影した後に、放射線画像に応じた画像処理条件を求める際、間引き画像データを用いる、もしくはこの処理条件を変更可能とすることで、より即時性もしくは診断性の高い画像データを得ることのできる放射線画像情報読取装置を提供することにある。また、被写体情報と被写体との関連付けを行うことにより撮影、読取りミスを救済できるようにした放射線画像情報読取装置を提供することにある。

【手続補正３】
【補正対象書類名】明細書
【補正対象項目名】００１９
【補正方法】変更
【補正内容】
【００１９】
【課題を解決するための手段】上記目的を達成するため、本発明は、

１）放射線画像が記録された放射線画像変換パネルを読み取って画像データを得る放射線画像情報読取装置であって、放射線画像が記録された放射線画像変換パネルを読み取って画像データを得る読取手段と、外部端末から入力された被写体情報を受信する受信手段と、前記受信手段で受信した被写体情報と被写体とを照合する照合手段とを有し、前記被写体情報と被写体との照合を完了した後に、前記被写体の放射線画像が記録された放射線画像変換パネルを読み取って画像データを得るように構成したことを特徴とする放射線画像情報読取装置、

２）放射線画像が記録された放射線画像変換パネルを読み取って画像データを得る放射線画像情報読取手段と、前記放射線画像の読み取りに応じて前記画像データに基づく画像を表示する表示手段と、前記画像データの特徴量から前記放射線画像に応じた画像処理条件を求める手段と、前記表示手段に表示される画像を前記処理条件に基づいて変更する変更手段と、前記画像処理条件を修正する手段と、を有する放射線画像情報読取表示装置、

３）放射線画像が記録された放射線画像変換パネルを読み取って画像データを得、該画像データに画像処理を施す放射線画像情報読取装置であって、放射線画像が記録された放射線画像変換パネルを読み取って画像データを得る読取手段と、前記画像データを間引いて間引き画像データを取得する手段と、前記間引き画像データに基づいて前記放射線画像に応じた画像処理条件を求める手段と、前記画像データを前記画像処理条件に基づいて処理する画像処理手段と、を有する放射線画像情報読取表示装置を提案するものである。

【手続補正４】
【補正対象書類名】明細書
【補正対象項目名】００２３
【補正方法】変更
【補正内容】
【００２３】このような装置の動作は以下に説明する。Ｘ線撮影される被写体２２の識別情報は、コントロール部２５のキーボード５３ａから入力される。この識別情報としては、ＩＤ番号、氏名、生年月日、性別、撮影部位、撮影日時等がある。ただし、撮影日時は、ＣＰＵ５０内に内蔵されているカレンダ・クロックにより自動的に挿入されるようにしてもよいし、外部機器でＩＤ情報を管理している場合はそれから送ってもらい照合のみ行うようにしてもよい。また、外部端末で入力されたものを受信して照合のみを行っても良い。また、ここで入力される識別情報は、その時点で撮影される患者に関するものだけでも良いし、一連の情報を予め入力しておいて、後に順に撮影を行っても良い。識別情報が入力され、被写体２２を撮影位置にセットして撮影を行う。撮影ボタンが押されると、ＣＰＵ５０は読取制御部５４ａに読取開始を指示する。読取制御部５４ａはＸ線アダプタ５４ｂを経由して駆動回路１０を制御し、放射線源２１に対してＸ線撮影を指示する。放射線源２１は、これによって被写体２２に向けて放射線（Ｘ線）を照射する。この放射線は被写体２２を透過し、放射線変換パネル２３の輝尽性蛍光体層に被写体２２の放射線透過率分布に従ったエネルギーが蓄積され、そこに被写体２２の潜像が形成される。以上により、Ｘ線撮影が終了する。

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CLAIMS

[Claim(s)]
[Claim 1] Said radiation image by which scans excitation light on the radiation image transformation panel which carries out are recording record of the radiation image information, and are recording record is carried out is read. In the radiation image information reading display which displays this read image data on a frame memory at storage and a display means The image data which carried out thinning-out read-out of said read image data from this frame memory in parallel to transmitting to said frame memory is displayed on said display means. The radiation image information reading display characterized by enabling it to change the image display condition and image data to said display means with an input means after reading in read.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the radiation image information reader which reads and displays the radiation image information by which are recording record is carried out on a photostimulable phosphor.

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PRIOR ART

[Description of the Prior Art] In order to obtain a radiation image conventionally, the X-ray photograph method has been used. The perspective diagram image was easily obtained inside the photographic subject, and many this approach has been used as a very leading approach in the diagnostic field especially in medicine. However, this approach had faults, like that the difference of the rate of radioparency of each organization in the body is small, and the contrast of the image obtained since X-rays are scattered about in a photographic subject is small, an X-ray's being harmful for the body, and latitude are narrow, and photography conditions are severe. effect of as opposed to [in order to compensate these faults, when sensibility uses a high X-ray detector with large latitude, changes an X-ray picture into an electrical signal and carries out an image processing] the body -- few -- in addition -- and the method of obtaining a high-definition image has been investigated.

[0003] As an example of such radiography, absorb and store up the radiation which penetrated the photographic subject in a fluorescent substance of a certain kind, excite this fluorescent substance with energy of a certain kind after an appropriate time, the energy of radiation which this fluorescent substance is accumulating is made to emit as fluorescence, and how to detect and image this fluorescence is considered. As a concrete approach, the radiation image transformation approach using the electromagnetic radiation chosen from a visible ray and infrared radiation as excitation energy is advocated by for example, a U.S. Pat. No. 3,859,527 number and JP,55-12144,A, using a photostimulable phosphor as a fluorescent substance.

[0004] The radiation image transformation panel in which the photostimulated luminescence body whorl was formed on the base material is used for this approach. By making the photostimulated luminescence body whorl of this radiation image transformation panel absorb the radiation which penetrated the photographic subject, storing up the energy of radiation corresponding to the strength of a radiation, and scanning this photostimulated luminescence body whorl with accelerated-phosphorescence excitation light after an appropriate time An image is obtained for the accumulated energy of radiation by the strength of drawing and this light as a signal of light. You may reproduce as hard copy and this final image may be reproduced on the picture tubes, such as CRT.

[0005] If said photostimulable phosphor is excited with energy of a certain kind, such as light or heat, after it irradiates radiations (an X-ray, alpha rays, beta rays, a gamma ray, ultraviolet rays, etc.), it will mean a fluorescent substance as accelerated-phosphorescence luminescence shown according to the energy of radiation accumulated into this fluorescent substance. Moreover, the thing of various gestalten, such as what makes the shape of a film with tabular (the shape of a panel), the shape of a drum, and flexibility to have a photostimulated luminescence body whorl side, is named the radiation image transformation panel which has the layer which contains a photostimulable phosphor here generically (a conversion panel is only called below).

[0006] Said approach has the very practical advantage that an image can be recorded over a very large radiation exposure region, as compared with the radiograph system which uses the conventional film photo. Namely, it is admitted that radiation light exposure, and the reinforcement or the quantity of light of accelerated-phosphorescence luminescence which emits light by accelerated-phosphorescence excitation light after radiation are recording reaches far and wide very much, and it is proportional in said conversion panel. Therefore, even if it changes radiation light exposure sharply according to various photography conditions, set the read gain of said accelerated-phosphorescence luminescence as a suitable value, read with a photo-electric-conversion means, and it changes into an electrical signal. The radiation image which is not influenced by fluctuation of radiation light exposure can be obtained by making it output to displays, such as record ingredients, such as photosensitive material, and CRT, as a visible image using this

electrical signal.
[0007] moreover, the thing which according to this approach suitable signal processing be perform after change into said conversion panel the radiation image by which are recording record be carried out at an electrical signal, and be make to output to displays, such as record ingredients, such as photosensitive material, and CRT, as a visible image using this electrical signal -- a diagnosis -- the very big effectiveness that the proper outstanding radiation image can be obtain be also expectable.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, the effect according to fluctuation of photography conditions etc. as mentioned above -- losing -- or a diagnosis -- in order to obtain the proper outstanding radiation image, it is indispensable to perform suitable signal processing for said radiation image for image information, such as the photography approaches, such as a record condition of the radiation image by which are recording record was carried out, a part of a photographic subject, or simple imaging, to a conversion panel based on the display of the visible image for the observation interpretation of radiogram.

[0009] In advance of the display of such a visible image, the approach indicated by JP,55-50180,A is learned as an approach of extracting the image information of the radiation image by which are recording record was carried out on a conversion panel. the optical reinforcement or the quantity of light of instant luminescence emitted from said conversion panel when this approach irradiates a radiation at a conversion panel detects said instant luminescence based on the knowledge of being proportional to the energy of radiation by which are-recording record is carried out, on a conversion panel -- the image information of a radiation image -- extracting -- this information -- being based -- suitable signal processing -- giving -- a diagnosis -- it is going to obtain the radiation image which is excellent proper. performing signal processing [**** / said radiation image] according to this approach -- possible -- the effect of fluctuation of photography conditions etc. -- losing -- moreover, a diagnosis, although the proper outstanding radiation image can be obtained Generally, the radiation irradiation section is divided into two or more member group, and is constituted, and moreover, since it is usually separated in [a radiation irradiation part and a radiation image read station place] location The signal-transmission system had to be constituted in the meantime, it became complicated in equipment, and there was a fault which avoids the rise of cost that it could not kick.

[0010] Moreover, in JP,55-116340,A, a non-photostimulable phosphor is prepared near the conversion panel, and the method of extracting the image information of the radiation image which detects with a photodetector luminescence which said non-photostimulable phosphor emits at the time of record of a radiation image, and is recorded on the conversion panel is indicated. However, in addition to the fault of the approach indicated by said JP,55-50180,A, since this approach did not use photostimulable phosphor itself as an object of an extract means, it remained in presuming image information indirectly, and had the fault that the dependability over the information acquired in this way was low.

[0011] Furthermore, the approach indicated by JP,58-67240,A is also learned as an approach of extracting the image information of the radiation image currently recorded on the conversion panel in advance of the display of a visible image. This approach precedes the read operation (henceforth this reading) which obtains the visible image for the observation interpretation of radiogram. The read operation for extracting the image information of the radiation image currently recorded on said conversion panel using the accelerated-phosphorescence excitation light of energy lower than the accelerated-phosphorescence excitation luminous energy used in this actuation (it is hereafter called a read ahead) -- carrying out -- this information -- being based -- suitable signal processing -- giving -- a diagnosis -- it is going to obtain the radiation image which was excellent proper.

[0012] However, since the amount of energy of radiation by which residual are recording is carried out in the case of this reading decreases the more the more this approach has the accelerated-phosphorescence excitation light energy in a read ahead, and it close to 1 in this reading, It is necessary to make accelerated-phosphorescence excitation light energy in a read ahead lower than it in this reading. For that purpose, enlarge the spot system of the accelerated-phosphorescence excitation light in a read ahead. The scan speed of the accelerated-phosphorescence excitation light in

which accelerated-phosphorescence excitation light reinforcement is reduced is made into size, or means, such as making passing speed of a conversion panel into size, had to be provided, and there was a fault from which the structure of a radiation image reader becomes it is remarkable and complicated.

[0013] Moreover, in this approach, accelerated-phosphorescence luminescence which needs to make accelerated-phosphorescence excitation light energy in point reading remarkably lower than it in **** for the above reasons, and is produced by the look ahead is very feeble. For this reason, in order it is difficult to extract said image information in a sufficiently high precision by read ahead or to extract said image information in a sufficiently high precision, there was a fault of having to raise remarkably the detectivity of the accelerated-phosphorescence luminescence detection system in a read ahead.

[0014] Furthermore, in this approach, even if it made accelerated-phosphorescence excitation light energy in a read ahead sufficiently lower than it in this reading, it was hard to avoid energy-of-radiation dissipation accumulated, and the accelerated-phosphorescence luminescence reinforcement or the quantity of light emitted by read ahead as a result in the case of this reading decreased, and had the serious fault that system sensitivity fell.

[0015] On the other hand, the approach a view completely differs from said approach is also learned. carrying out data processing of the radiation picture signal memorized by said image storage, after this approach's reading the radiation image by which are recording record is carried out on a conversion panel and making it store it temporarily at image storage -- the image information of said radiation image -- extracting -- this information -- being based -- suitable signal processing -- giving -- a diagnosis -- it is going to obtain the radiation image which was excellent proper. However, since it was necessary to once store a radiation image in image storage and this approach needed to carry out data processing further, data processing took long time amount to it, it required time amount by the display from reading of a radiation image, and had the serious fault of being scarce, to real time nature.

[0016] Moreover, the image extract means for grasping the condition of an image, by the time it memorizes from reading of an image so that it may be indicated by JP,62-97533,A is established, and the approach of raising real time nature is also indicated.

[0017] Real image data is used for this method, and the real-time operation of it becomes possible, and it turns into a method with a very high precision. However, while the rapidity of processing synchronizing with reading of image data is required, since the operation precision of 23 bits is required also only by performing simple processing in which a histogram is created in order that image data may also amount to a maximum of 5 million pixels, the usual microcomputer cannot be used but exclusive hardware is needed. moreover, the quality of the condition of a display image -- also judging -- the judgment of the quality of photography of the delay of the display processing -- delaying -- a photography mistake etc. -- setting -- re--- photography time and effort is made [many] also taking a photograph.

[0018] The purpose of this invention is to offer the radiation image information reading display which will perform the display which can grasp the condition of an image by little [almost] data processing to coincidence if a radiation image is photoed on a conversion panel, enables modification of the image data and display condition under reading and after read, and enables a display of the high image of diagnosis nature, and enabled it to relieve a photography mistake.

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, said radiation image by which this invention scans excitation light on the radiation image transformation panel which carries out are recording record of the radiation image information, and are recording record is carried out is read. In the radiation image information reading display which displays this read image data on a frame memory at storage and a display means The image data which carried out thinning-out read-out of said read image data from this frame memory in parallel to transmitting to said frame memory is displayed on said display means. The radiation image information reading display into which it enabled it to change the image display condition and image data to said display means with an input means after reading in read is proposed.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the radiation image information reader which reads and displays the radiation image information by which are recording record is carried out on a photostimulable phosphor.
[0002]
[Description of the Prior Art] In order to obtain a radiation image conventionally, the X-ray photograph method has been used. The perspective diagram image was easily obtained inside the photographic subject, and many this approach has been used as a very leading approach in the diagnostic field especially in medical care. However, this approach had faults, like that the difference of the rate of radioparency of each organization in the body is small, and the contrast of the image obtained since X-rays are scattered about in a photographic subject is small, an X-ray's being harmful for the body, and latitude are narrow, and photography conditions are severe. effect of as opposed to [in order to compensate these faults, when sensibility uses a high X-ray detector with large latitude, changes an X-ray picture into an electrical signal and carries out an image processing] the body -- few -- in addition -- and the method of obtaining a high-definition image has been investigated.
[0003] As an example of such radiography, absorb and store up the radiation which penetrated the photographic subject in a fluorescent substance of a certain kind, excite this fluorescent substance with energy of a certain kind after an appropriate time, the energy of radiation which this fluorescent substance is accumulating is made to emit as fluorescence, and how to detect and image this fluorescence is considered. As a concrete approach, the radiation image transformation approach using the electromagnetic radiation chosen from a visible ray and infrared radiation as excitation energy is advocated by for example, a U.S. Pat. No. 3,859,527 number and JP,55-12144,A, using a photostimulable phosphor as a fluorescent substance.
[0004] The radiation image transformation panel in which the photostimulated luminescence body whorl was formed on the base material is used for this approach. By making the photostimulated luminescence body whorl of this radiation image transformation panel absorb the radiation which penetrated the photographic subject, storing up the energy of radiation corresponding to the strength of a radiation, and scanning this photostimulated luminescence body whorl with accelerated-phosphorescence excitation light after an appropriate time An image is obtained for the accumulated energy of radiation by the strength of drawing and this light as a signal of light. You may reproduce as hard copy and this final image may be reproduced on the picture tubes, such as CRT.
[0005] If said photostimulable phosphor is excited with energy of a certain kind, such as light or heat, after it irradiates radiations (an X-ray, alpha rays, beta rays, a gamma ray, ultraviolet rays, etc.), it will mean a fluorescent substance as accelerated-phosphorescence luminescence shown according to the energy of radiation accumulated into this fluorescent substance. Moreover, the thing of various gestalten, such as what makes the shape of a film with tabular (the shape of a panel), the shape of a drum, and flexibility to have a photostimulated luminescence body whorl side, is named the radiation image transformation panel which has the layer which contains a photostimulable phosphor here generically (a conversion panel is only called below).
[0006] Said approach has the very practical advantage that an image can be recorded over a very large radiation exposure region, as compared with the radiograph system which uses the conventional film photo. Namely, it is admitted that radiation light exposure, and the reinforcement or the quantity of light of accelerated-phosphorescence luminescence which emits light by accelerated-phosphorescence excitation light after radiation are recording reaches

far and wide dramatically, and it is proportional in said conversion panel. Therefore, even if it changes radiation light exposure substantially according to various photography conditions, set the read gain of said accelerated-phosphorescence luminescence as a suitable value, read with a photo-electric-translation means, and it changes into an electrical signal. The radiation image which is not influenced by fluctuation of radiation light exposure can be obtained by making it output to displays, such as record ingredients, such as photosensitive material, and CRT, as a visible image using this electrical signal.

[0007] moreover, the thing which according to this approach suitable signal processing be perform after change into said conversion panel the radiation image by which are recording record be carried out at an electrical signal, and be make to output to displays, such as record ingredients, such as photosensitive material, and CRT, as a visible image using this electrical signal -- a diagnosis -- the very big effectiveness that the proper outstanding radiation image can be obtain be also expectable.

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[Problem(s) to be Solved by the Invention] however, the effect according to fluctuation of photography conditions etc. as mentioned above -- losing -- or a diagnosis -- in order to obtain the proper outstanding radiation image, it is indispensable to perform suitable signal processing for said radiation image for image information, such as the photography approaches, such as a record condition of the radiation image by which are recording record was carried out, a part of a photographic subject, or simple imaging, to a conversion panel based on the display of the visible image for the observation interpretation of radiogram.

[0009] In advance of the display of such a visible image, the approach indicated by JP,55-50180,A is learned as an approach of extracting the image information of the radiation image by which are recording record was carried out on a conversion panel. the optical reinforcement or the quantity of light of instant luminescence emitted from said conversion panel when this approach irradiates a radiation at a conversion panel detects said instant luminescence based on the knowledge of being proportional to the energy of radiation by which are-recording record is carried out, on a conversion panel -- the image information of a radiation image -- extracting -- this information -- being based -- suitable signal processing -- giving -- a diagnosis -- it is going to obtain the radiation image which is excellent proper. performing signal processing [**** / said radiation image] according to this approach -- possible -- the effect of fluctuation of photography conditions etc. -- losing -- moreover, a diagnosis, although the proper outstanding radiation image can be obtained Generally, the radiation irradiation section is divided into two or more member group, and is constituted, and moreover, since it is usually separated in [a radiation irradiation part and a radiation image read station place] location The signal-transmission system had to be constituted in the meantime, it became complicated in equipment, and there was a fault which avoids lifting of cost that it could not kick.

[0010] Moreover, in JP,55-116340,A, a non-photostimulable phosphor is prepared near the conversion panel, and the method of extracting the image information of the radiation image which detects with a photodetector luminescence which said non-photostimulable phosphor emits at the time of record of a radiation image, and is recorded on the conversion panel is indicated. However, in addition to the fault of the approach indicated by said JP,55-50180,A, since this approach did not use photostimulable phosphor itself as an object of an extract means, it remained in presuming image information indirectly, and had the fault that the dependability over the information acquired in this way was low.

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[0012] However, since the amount of energy of radiation by which residual are recording is carried out in the case of this reading decreases the more the more this approach has the accelerated-phosphorescence excitation light energy in a read ahead, and it close to 1 in this reading, It is necessary to make accelerated-phosphorescence excitation light energy in a read ahead lower than it in this reading. For that purpose, enlarge the spot system of the accelerated-phosphorescence excitation light in a read ahead. The scan speed of the accelerated-phosphorescence excitation light in

which accelerated-phosphorescence excitation light reinforcement is reduced is made into size, or means, such as making passing speed of a conversion panel into size, had to be provided, and there was a fault from which the structure of a radiation image reader becomes it is remarkable and complicated.

[0013] Moreover, in this approach, accelerated-phosphorescence luminescence which needs to make accelerated-phosphorescence excitation light energy in point reading remarkably lower than it in **** for the above reasons, and is produced by the look ahead is very feeble. For this reason, in order it is difficult to extract said image information in a sufficiently high precision by read ahead or to extract said image information in a sufficiently high precision, there was a fault of having to raise remarkably the detectivity of the accelerated-phosphorescence luminescence detection system in a read ahead.

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[0015] On the other hand, the approach a view completely differs from said approach is also learned. the radiation image with which are recording record of this approach is carried out at the conversion panel -- reading -- **** -- carrying out data processing of the radiation picture signal memorized by said image storage, after making it store temporarily at image storage -- the image information of said radiation image -- extracting -- this information -- being based -- suitable signal processing -- giving -- a diagnosis -- it is going to obtain the radiation image which was excellent proper. However, since it was necessary to once store a radiation image in image storage and this approach needed to carry out data processing further, data processing took long time amount to it, it required time amount by the display from reading of a radiation image, and had the serious fault of being scarce, to real time nature.

[0016] Moreover, the image extract means for grasping the condition of an image, by the time it memorizes from reading of an image so that it may be indicated by JP,62-97533,A is established, and the approach of raising real time nature is also indicated.

[0017] Real image data is used for this method, and the real-time operation of it becomes possible, and it turns into a method with a very high precision. However, while the rapidity of processing synchronizing with reading of image data is required, since the operation precision of 23 bits is required also only by performing simple processing in which a histogram is created in order that image data may also amount to a maximum of 5 million pixels, the usual microcomputer cannot be used but exclusive hardware is needed. moreover, the quality of the condition of a display image -- also judging -- the judgment of the quality of photography of the delay of the display processing -- delaying -- a photography mistake etc. -- setting -- re--- photography time and effort is made [many] also taking a photograph.

[0018] The object of this invention is to offer the radiation image information reading display which will perform the display which can grasp the condition of an image by little data processing almost simultaneous if a radiation image is photoed on a conversion panel, enables modification of the image data and display condition under reading and after read, and enables a display of the high image of diagnosis nature, and enabled it to relieve a photography mistake.

[0019]

[Means for Solving the Problem] In order to attain the above-mentioned object, said radiation image by which this invention scans excitation light on the radiation image transformation panel which carries out are recording record of the radiation image information, and are recording record is carried out is read. In the radiation image information reading display which displays this read image data on a frame memory at storage and a display means The image data which carried out thinning-out read-out of said read image data from this frame memory in parallel to transmitting to said frame memory is displayed on said display means. The radiation image information reading display into which it enabled it to change the image display condition and image data to said display means with an input means after reading in read is proposed.

[0020]

[Example] Hereafter, the example of this invention is explained to a detail with reference to a drawing. Drawing 3 is the block diagram of the radiation image photography equipment concerning this invention, and, in the case of thorax radiography equipment, is shown. The radiation from the radiation source 21 lets at least the thorax of a photographic subject 22 pass, and is irradiated by the radiation conversion panel 23. The front face of the radiation image information record read station 24 is equipped with the radiation conversion panel 23, and it is equipped with the light-scanning machine 42 made to scan while irradiating the light beam from the light beam section 41 (gas laser and solid

state laser are sufficient as this), and the light beam section 41 which used semiconductor laser at the radiation conversion panel 23, and the optical/electrical converter 43 which detects the accelerated-phosphorescence luminescence light which the radiation conversion panel 23 emits in the radiation image information record read station 24. An optical/electrical converter 43 consists of photograph mull 43c which changes into an electrical signal the light which let condensing body 43a which consists of an optical fiber, filter 43b which passes only the light of an accelerated-phosphorescence luminescence wavelength field, and filter 43b pass. next, the voltage signal of the current-electrical-potential-difference converter 44 which changes the output current from an optical/electrical converter 43 into a voltage signal in the radiation image information record read station 24, and the current-electrical-potential-difference converter 44 -- a logarithm -- it has the logarithmic amplifier 45 amplified-like and A/D converter 46 which changes the output of an amplifier 45 into digital data.

[0021] In order that A/D converter 46 may change faithfully the image of the large dynamic range which the radiation conversion panel 23 has as much as possible, the range of triple figures accelerated-phosphorescence luminescence light is obtained as 10-bit translation data. Furthermore, in the radiation image information write reading section 24, it has the control circuit 47 which inputs the data from A/D converter 46, and this control circuit 47 adjusts the reading gain of radiation image information synthetically while performing optical beam adjustment of the light beam section 41 on the strength, the gain adjustment of the photograph mull by the supply voltage regulation of the high voltage power supply 48 for photograph mull, gain control of the current-electrical-potential-difference converter 44 and A/D converter 46, and input dynamic range adjustment of A/D converter 46.

[0022] Next, the control section 25 is used as a computer control system, and is combined with the following processing elements by the central processing unit (Following CPU is called) 50 by the system bus SB and image bus VB. The image display means (picture monitor) image display means 51 is combined with CPU50 through display and control section 51a and a system bus SB, and the frame memory 52 as a storage means is combined with CPU50 through frame memory control-section 52a and a system bus SB. The information input means 53 consists of keyboard 53a and LCD display means 53b, and is combined with CPU50 through interface 53c. The synchronous means 54 for reading consists of X-ray adapter 54b combined with reading control-section 54a combined with CPU50, and this reading control-section 54a, and is combined with the actuation circuit 10 of the radiation source 1, and a control circuit 47. The I/O interface over the external instrument which 56 does not illustrate, a magnetic-disk control section [as opposed to a magnetic disk drive 58 (or an external optical disk unit, a magnetic tape unit) in 57], and 59 are memory. In addition, association also with an external terminal of CPU50 is enabled.

[0023] Actuation of such equipment is explained below. The identification information of the photographic subject 22 by which roentgenography is carried out is inputted from keyboard 53a of the control section 25. As this identification information, there are an ID number, a name, a date of birth, sex, a photography part, photography time, etc. However, photography time may be made to be inserted with the calender clock built in in CPU50 automatically, and when ID information is managed with the external instrument, it swerves, it withers, and I have it spent, and it may be made to perform only collating. Moreover, you may only collate by receiving what was inputted at the external terminal. moreover, the thing about the patient by whom the identification information inputted here is photoed at the event -- good -- it carries out, a series of information is inputted beforehand, and a photograph may be taken in order behind. Identification information is inputted and a photograph is taken by setting a photographic subject 22 to a camera station. If a photography carbon button is pushed, CPU50 directs reading initiation to reading control-section 54a. Reading control-section 54a controls the actuation circuit 10 via X-ray adapter 54b, and directs roentgenography to the radiation source 21. The radiation source 21 irradiates a radiation (X-ray) towards a photographic subject 22 by this. This radiation penetrates a photographic subject 22, the energy according to the rate distribution of a radioparency of a photographic subject 22 is accumulated in the photostimulated luminescence body whorl of the radiation conversion panel 23, and the latent image of a photographic subject 22 is formed there. Roentgenography is completed by the above.

[0024] After roentgenography is completed, the light beam section 41 generates the light beam by which beam reinforcement was controlled, it is changed with the light-scanning vessel 42, an optical path is changed with a reflecting mirror, and the light beam is led to the radiation conversion panel 23 as an excitation scan light. The radiation conversion panel 23 outputs the accelerated-phosphorescence luminescence light proportional to the latent-image energy by excitation scan light. An optical/electrical converter 43 detects this accelerated-phosphorescence luminescence light, and outputs the current signal corresponding to incident light. Through the current-electrical-

potential-difference transducer 44, an amplifier 45, and A/D converter 46, this output current serves as digital image data, is impressed to a control circuit 47, and is transmitted to the control section 25.
[0025] Drawing 4 is configuration block drawing of reading control-section 54a in the control section 25. This reading control-section 54a consists of line buffers A and B which consist of the input switch SW1 and the output switch SW2 which synchronize mutually and are switched, and RAM of the memory capacity for 2048 pixels. Here, line buffers A and B are equivalent to one line of the main scanning direction of image data. If the image data of the 1st line from the radiation image information record read station 24 is memorized by the line buffer A, the input switch SW1 and the output switch SW2 will be switched, and the image data of the 2nd line will be memorized by the line buffer B. The image data of the 1st line of a line buffer A is outputted to this and coincidence, it lets the image bus VB pass, and sequential storage is carried out at the frame memory 52. For every line, input/output switches SW1 and SW2 are switched, and line buffer A/B changes the role.
[0026] Drawing 5 is the configuration schematic diagram of a frame memory 52. This frame memory 52 consists of RAM with the storage capacity for 2048*2560 pixels. The image data of one line which was changed by the radiation image information record read station 24, and was stored temporarily by line buffer A/B is memorized at a time by the frame memory 52. Via the image bus VB, it is transmitted to display and control section 51a, or the image data memorized by this and coincidence is transmitted to the magnetic-disk control section 57.
[0027] When transmitting image data to display and control section 51a from a frame memory 52, horizontal scanning and the direction of vertical scanning are continuously written in the display memory in read-out and display and control section 51a at intervals of 4 pixels from the frame memory 52. Since CRT for a display has only the display resolution which is 512 pixels * 640 pixels, this is for thinning out to one fourth in ******. Moreover, when transmitting image data to the magnetic-disk control section 57 from a frame memory 52, it writes in continuously from the frame memory 52 succeeding the FIFO memory in read-out and the magnetic-disk control section 57. Thus, in order to make a frame memory 52 accessible in succession [thin out or], frame memory control-section 52a is taken as the configuration shown in drawing 1 .
[0028] in this drawing, fundamentally, the R/W timing of the overall frame memory 52 is generated in the frame memory timing-control circuit 61, and the address of the frame memory 52 which should be accessed by the main scanning direction address generator 62 of X shaft orientations and the direction address generator 63 of vertical scanning of Y shaft orientations specifies -- having -- data -- the image bus VB -- going -- read-out -- or -- ** -- writing is made. 11 bits which made the main scanning direction address generator 62 correspond to 2048 pixels, and the direction address generator 63 of vertical scanning consist of 12 bits made equivalent to 2560 pixels, and also become the same configuration.
[0029] Here, it explains by the case where it reads at intervals of 4 pixels. First, CPU50 sets the address of a top pixel location to a latch circuit 65 and a latch circuit 66 through the I/F logic 64. Next, CPU50 sets to a latch circuit 67 and a latch circuit 68 +4 which is the increment of the address. And CPU50 sets the read-out flag of the command latch in the frame memory timing-control circuit 61, and the direction addition flag of X, and orders it initiation of data transfer.
[0030] By this command, the frame memory timing-control circuit 61 sets the pixel location data of the head of a latch circuit 65 and a latch circuit 66 to a latch circuit 71 and a latch circuit 72 through multiplexers 69 and 70 first, changes these latch data by the multiplexer 73, and generates a frame memory address through a buffer 74. If the pixel data of the head by this frame memory address are read, the frame memory timing-control circuit 61 will switch a multiplexer 69 to an adder subtracter 75 side. An adder subtracter 75 subtracts and adds the latch data of a latch circuit 67 and a latch circuit 71, and sets to this latch circuit 71 the pixel location data which added the increment +4 of a latch circuit 67 to the current value of a latch circuit 71 for every timing signal from the frame memory timing-control circuit 61. By this control, the frame memory timing-control circuit 61 performs +4 incremental control of the main scanning direction address generator 62, whenever one pixel data is transmitted.
[0031] The direction address generator 63 of vertical scanning is performed like actuation of the above-mentioned scanning direction address generator 62 for every transfer termination of one line at the time of transfer termination of one line, and it performs +4 incremental control. Moreover, whenever the frame memory timing-control circuit 61 reads one pixel, it gives RAS and a CAS signal to the frame memory 52 of DRAM, and it also controls refresh actuation. The image data which thinned out and set the photography image to one fourth by the above control can be obtained.
[0032] When changing the rate of infanticide, it accomplishes by changing the set point to a latch circuit 67 and a latch

circuit 68. For example, when the set point to a latch circuit 67 and a latch circuit 68 is +1, it becomes continuation access, and by -1, the set point to a latch circuit 67 can read a mirror reversed image, when the set point to a latch circuit 68 is +1.

[0033] Although the image data read from the frame memory 52 is transmitted through the I/F logic 77 and the image bus VB, in CPU50, it is carrying out transmission control of it one line at a time, and if the transfer to the magnetic-disk control section 57 is needed during a transfer to display and control section 51a, it will store this address at the event at the time of transfer termination of this line, and transmits by setting up the address of the frame memory which should be transmitted to the magnetic-disk control section 57, and a delta value and a command. And the address which it is at the transfer termination event and was being stored, an increment, a command, etc. are reset, and the transfer to display and control section 51a is resumed. Although the overhead in a latch or setting out to a register exists and this reduces effective speed, compared with an image transfer, frequency is very low, and it enables juxtaposition actuation seemingly.

[0034] moreover, under reading actuation -- the frame memory 52 from the control circuit 47 of the radiation image information record read station 24 -- display and control section 51from frame memory 52 a -- or the magnetic-disk control section 57 -- ** -- although the transfer to say is performed for above-mentioned business in juxtaposition, the data storage to a display for the image display means 51 and a magnetic disk drive 58 is made almost simultaneously with reading termination.

[0035] And at the time of reading termination, CPU50 sets a start address as a latch circuit 65 and a latch circuit 66, sets +32 as a latch circuit 67 and a latch circuit 68, and transmits to the buffer memory in the magnetic-disk control section 57. The number of pixels at this time becomes 64*64 pixels a total of 4096 pixels. This becomes the form which the main-sub scan performed pixel infanticide to 1/32, and trimmed the image for the square. Using this image data, CPU50 searches for the accumulation frequency distribution of an image, searches for the image-processing conditions which are the optimal display property of an image, and changes the content of the look-up table for a display in display and control section 51a. Thus, this invention person finds out that change hardly breaks out with the image data of an original copy in characteristic quantity and accumulation frequency distribution, such as ** which thins out and (a pixel number is 1/1024) makes a main-sub scan 1/32, maximum which an image has, the minimum value, and the median, an operation is extremely simplified by using this phenomenon, and it enables it to judge even a 16-bit microprocessor that there is almost no time lag in acquiring the optimal display property of an image. Drawing 6 (A) thru/or drawing 9 (H) illustrate the accumulation frequency distribution and the frequency distribution property in each rate of infanticide. Even if the accumulation frequency distribution (drawing 8 (F)) thinned out every 32 pixels even if it compared with the accumulation frequency distribution (drawing 6 (A)) of original image data as I understood also by this example is carrying out the same configuration and presumes an image condition using this, it is almost satisfactory. Moreover, even if it uses the image of the rate of infanticide beyond this (drawing 9 (G), (H)), since the presumption is seldom out of order, it is effective also in processing time also in hard.

[0036] And if it is drawing 7 (D) and drawing 8 (E) extent, it is possible to perform not to become so big the processing time, even if it uses 16-bit CPU, but to presume using original copy image data, and processing which is not inferiority, and it is effective.

[0037] In addition, an X-ray picture has that it spoils [little] the description even if the information on an image periphery has low effect to the whole and excludes and extracts the upper part and the lower part as an extract field of an image. Reading control of only the center section in such a case, and when a reading image becomes fairly smaller than 2048*2560 pixels, the rate of infanticide is made as small as 31, 30, and ..., it thins out with a reading field, such as reading within the limits of an image field, and proper adjustment of a rate can be easily performed by modification of latch data.

[0038] As an example, when reading the image of 2048 pixels of horizontal scanning, and 2464 pixels of vertical scanning, 64*64-pixel extract data can be obtained for the 2048*2048-pixel image which excluded the upper part and the lower part of 208 lines at a time, respectively by 1/32 of pixel infanticide. An extract can be completed before 200 lines or more which reading ends, and this can calculate accumulation frequency distribution after that, can compute maximum, the minimum value, the median, etc., and can terminate all operations before ** which creates look-up table data with the optimal property for the image which is image-processing conditions, and reading termination. This means enabling observation of a CRT image in the optimal display property almost simultaneously with reading termination, if the look-up table for a display in display and control section 51a is changed.

[0039] Drawing 2 shows the block diagram of display and control section 51a. The image data which let the image bus VB pass is written in the memory 81 for a sequential display through a data buffer 80. This memory 81 for a display has the storage capacity for 512*640 pixels for 10 bit data. A sequential transfer is carried out at the look-up table 82 for a display which changes 10 bits (1024 level) data into 8 bits, conversion compression of the stored data of the memory 81 for a display is carried out at 8-bit data, and this data is changed into analog data with D/A converter 83, is further amplified and video-signal-ized for CRT with amplifier 84, and is given to a CRT display machine. Write-in read-out control according [the memory 81 for a display] to the memory control circuit 85 is made, and the display control of the whole, such as data transfer control and generation of a synchronizing signal, is made by the display-control circuit 86. It gives through a system bus SB and the I/F logic 87 from CPU50, and the command for these control is ******.

[0040] The display control of such a configuration is explained below. The display changes with rewriting control of the look-up table 82 for a display by CPU50 at the event. Then, CPU50 eliminates the image currently displayed on the display-control circuit 86 till then by giving clear command at the time of photography initiation. This uses a dual port RAM as memory 81 for a display, and can end it by one-frame display time by writing in black data from a read-out port side. Here, in case the memory 81 for a display is eliminated, linearity table data are written in the look-up table 82 for a display. This makes it possible to catch a gap of a camera station and near sensibility of image data by enabling observation of the whole region of image data at the display under reading. For example, although the range of triple figures of X dosage is quantized to 10 bits and digital image data are obtained in the radiation image information record read station 24, the effective range is about 1.5 figures and image data enables it to observe actually in which hit of the level of 10 bits (0-1023) it exists by CRT. The check of whether the image is located white and near the black level by the setting-out mistake of photography conditions from this observation is enabled, and it enables it to judge immediately whether re-photography is needed.

[0041] By processing extract image data according to image-processing conditions, the display image of CRT changes to the image which has suitable gradation almost simultaneously with reading termination, and is used as the good image of diagnosis nature. At this time, when the irradiation field and photography conditions of photography differ from usual greatly, it may not become the image it is satisfied with the gradation property set up beforehand of an image enough. In this case, it can respond by changing gradation by scanning the function key for gradation control of keyboard 53a. That is, since the gamma value which is the concentration and the inclination of an image is important for an X-ray picture, image-processing conditions are amended in digital one by changing the two parameters by the look-up table 82 for a display which are image-processing conditions. From the thing to the above, an image check is immediately enabled after photography and the image which moreover has desired gradation nature is made observable.

[0042] Moreover, when observing an image even into details, amplification of keyboard 53a and the function key for panning also enable it to perform amplification and panning of an image. Amplification of an image is possible by reducing the rate of infanticide and transmitting to the memory 81 for a display from a frame memory, and panning is realized because only the amount to which an image is moved transmits only the image of the part which shifts the read-out starting address of the memory 81 for a display, and appears in CRT newly. In order to enable this control, the memory 81 for a display is constituted so that a main scanning direction and the direction of vertical scanning may serve as endless.

[0043] Furthermore, while the image is carrying out right-and-left reversal by the photography approach, it can correct by performing right-and-left reversal of an image with a left dextrotorsion diversion function key. Moreover, when a photographic subject name, a date of birth, etc. have an input mistake, it becomes correctable by the keyboard. Although it moves to the next photography when the above checks are completed, all data are decided at this event and the transfer to an external instrument is attained. Moreover, there is no next photography and automatic transfer to an external instrument can also be made possible by making data decide automatically after fixed time amount progress to which an operator will not operate it.

[0044] In the case of the microfilm duplicator which the case of the host computer of a high order also has and records an image, it is possible for an above-mentioned external instrument to make it both further. Among these, when making it a host computer, it realizes by making image data into every two or more lines 1 block, transmitting to the buffer memory under interface for external instruments via the image bus VB, if it reads from the magnetic-disk control section 57, and transmitting to a host computer. Moreover, CPU50 sets up the look-up table under interface first, and is

made similar to the image observed by CRT in the case of a microfilm duplicator. And it is made to print by performing an image transfer. That is, CRT has composition which is outputted and can display the image corresponding to the image by which image recording is carried out.

[0045] In addition, even if it uses an external instrument as a host computer and makes it a microfilm duplicator, to becoming a high-speed processor, execution speed may be reduced greatly or it may not be of use for a transfer to transmit image data with read-out from a magnetic disk drive 58. On this problem, a frame memory 52 can be extended by further 1 screen, and improvement in execution speed can be aimed at by carrying out a change-over activity the object for reading, and for a transfer on it. Moreover, about the image which carried out transfer termination to the external instrument, the management information of a magnetic disk drive 58 can be deleted, and it can prevent this magnetic disk drive 58 overflowing.

[0046]

[Effect of the Invention] This invention displays the image data which carried out read-out of the read image data from this frame memory in parallel to transmitting to a frame memory on a display means as above. Since it enabled it to change the image display condition and image data to a display means with an input means after reading in read, The quality can be promptly checked by image display almost simultaneous with the read of image data. There is effectiveness which makes re-photography unnecessary by modification of image data also in a photography mistake etc. by modification of a display image and image data after reading in read, and makes easy a change to the good image data of diagnosis nature.

[Translation done.]

* NOTICES *

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EFFECT OF THE INVENTION

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EXAMPLE

[Example] Hereafter, the example of this invention is explained to a detail with reference to a drawing. Drawing 3 is the block diagram of the radiation image photography equipment concerning this invention, and, in the case of thorax radiography equipment, is shown. The radiation from the radiation source 21 lets at least the thorax of a photographic subject 22 pass, and is irradiated by the radiation conversion panel 23. The front face of the radiation image information record read station 24 is equipped with the radiation conversion panel 23, and it is equipped with the light-scanning machine 42 made to scan while irradiating the light beam from the light beam section 41 (gas laser and solid state laser are sufficient as this), and the light beam section 41 which used semiconductor laser at the radiation conversion panel 23, and the optical/electrical converter 43 which detects the accelerated-phosphorescence luminescence light which the radiation conversion panel 23 emits in the radiation image information record read station 24. An optical/electrical converter 43 consists of photograph mull 43c which changes into an electrical signal the light which let condensing body 43a which consists of an optical fiber, filter 43b which passes only the light of an accelerated-phosphorescence luminescence wavelength field, and filter 43b pass. next, the voltage signal of the current-electrical-potential-difference converter 44 which changes the output current from an optical/electrical converter 43 into a voltage signal in the radiation image information record read station 24, and the current-electrical-potential-difference converter 44 -- a logarithm -- it has the logarithmic amplifier 45 amplified-like and A/D converter 46 which changes the output of an amplifier 45 into digital data.

[0021] In order that A/D converter 46 may change faithfully the image of the large dynamic range which the radiation conversion panel 23 has as much as possible, the range of triple figures accelerated-phosphorescence luminescence light is obtained as 10-bit translation data. Furthermore, in the radiation image information write reading section 24, it has the control circuit 47 which inputs the data from A/D converter 46, and this control circuit 47 adjusts the reading gain of radiation image information synthetically while performing optical beam adjustment of the light beam section 41 on the strength, the gain adjustment of the photograph mull by the supply voltage regulation of the high voltage power supply 48 for photograph mull, gain control of the current-electrical-potential-difference converter 44 and A/D converter 46, and input dynamic range adjustment of A/D converter 46.

[0022] Next, the control section 25 is used as a computer control system, and is combined with the following processing elements by the central processing unit (Following CPU is called) 50 by the system bus SB and image bus VB. The image display means (picture monitor) image display means 51 is combined with CPU50 through display and control section 51a and a system bus SB, and the frame memory 52 as a storage means is combined with CPU50 through frame memory control-section 52a and a system bus SB. The information input means 53 consists of keyboard 53a and LCD display means 53b, and is combined with CPU50 through interface 53c. The synchronous means 54 for reading consists of X-ray adapter 54b combined with reading control-section 54a combined with CPU50, and this reading control-section 54a, and is combined with the drive circuit 10 of the radiation source 1, and a control circuit 47. The I/O interface over the external instrument which 56 does not illustrate, a magnetic-disk control section [as opposed to a magnetic disk drive 58 (or an external optical disk unit, a magnetic tape unit) in 57], and 59 are memory. In addition, association also with an external terminal of CPU50 is enabled.

[0023] Actuation of such equipment is explained below. The identification information of the photographic subject 22 by which roentgenography is carried out is inputted from keyboard 53a of the control section 25. As this identification information, there are an ID number, a name, a birth date, sex, a photography part, photography time, etc. However, photography time may be made to be inserted with the calender clock built in in CPU50 automatically, and when ID

information is managed with the external instrument, it swerves, it withers, and I have it spent, and it may be made to perform only collating. Moreover, you may only collate by receiving what was inputted at the external terminal. moreover, the thing about the patient by whom the identification information inputted here is photoed at the time -- good -- it carries out, a series of information is inputted beforehand, and a photograph may be taken in order behind. Identification information is inputted and a photograph is taken by setting a photographic subject 22 to a camera station. If a photography carbon button is pushed, CPU50 directs reading initiation to reading control-section 54a. Reading control-section 54a controls the drive circuit 10 via X-ray adapter 54b, and directs roentgenography to the radiation source 21. The radiation source 21 irradiates a radiation (X-ray) towards a photographic subject 22 by this. This radiation penetrates a photographic subject 22, the energy according to the rate distribution of a radioparency of a photographic subject 22 is accumulated in the photostimulated luminescence body whorl of the radiation conversion panel 23, and the latent image of a photographic subject 22 is formed there. Roentgenography is completed by the above.

[0024] After roentgenography is completed, the light beam section 41 generates the light beam by which beam reinforcement was controlled, it is changed with the light-scanning vessel 42, an optical path is changed with a reflecting mirror, and the light beam is led to the radiation conversion panel 23 as an excitation scan light. The radiation conversion panel 23 outputs the accelerated-phosphorescence luminescence light proportional to the latent-image energy by excitation scan light. An optical/electrical converter 43 detects this accelerated-phosphorescence luminescence light, and outputs the current signal corresponding to incident light. Through the current-electrical-potential-difference transducer 44, an amplifier 45, and A/D converter 46, this output current serves as digital image data, is impressed to a control circuit 47, and is transmitted to the control section 25.

[0025] Drawing 4 is the configuration block Fig. of reading control-section 54a in the control section 25. This reading control-section 54a consists of line buffers A and B which consist of the input switch SW1 and the output switch SW2 which synchronize mutually and are switched, and RAM of the memory capacity for 2048 pixels. Here, line buffers A and B are equivalent to one line of the main scanning direction of image data. If the image data of the 1st line from the radiation image information record read station 24 is memorized by the line buffer A, the input switch SW1 and the output switch SW2 will be switched, and the image data of the 2nd line will be memorized by the line buffer B. The image data of the 1st line of a line buffer A is outputted to this and coincidence, it lets the image bus VB pass, and sequential storage is carried out at the frame memory 52. For every line, input/output switches SW1 and SW2 are switched, and line buffer A/B changes the role.

[0026] Drawing 5 is the configuration schematic diagram of a frame memory 52. This frame memory 52 consists of RAM with the storage capacity for 2048*2560 pixels. The image data of one line which was changed by the radiation image information record read station 24, and was stored temporarily by line buffer A/B is memorized at a time by the frame memory 52. Via the image bus VB, it is transmitted to display and control section 51a, or the image data memorized by this and coincidence is transmitted to the magnetic-disk control section 57.

[0027] When transmitting image data to display and control section 51a from a frame memory 52, horizontal scanning and the direction of vertical scanning are continuously written in the display memory in read-out and display and control section 51a at intervals of 4 pixels from the frame memory 52. Since CRT for a display has only the display resolution which is 512 pixels * 640 pixels, this is for thinning out to one fourth in ******. Moreover, when transmitting image data to the magnetic-disk control section 57 from a frame memory 52, it writes in continuously from the frame memory 52 succeeding the FIFO memory in read-out and the magnetic-disk control section 57. Thus, in order to make a frame memory 52 accessible in succession [thin out or], frame memory control-section 52a is taken as the configuration shown in drawing 1 .

[0028] in this drawing, fundamentally, the R/W timing of the overall frame memory 52 is generated in the frame memory timing control circuit 61, and the address of the frame memory 52 which should be accessed by the main scanning direction address generator 62 of X shaft orientations and the direction address generator 63 of vertical scanning of Y shaft orientations specifies -- having -- data -- the image bus VB -- going -- read-out -- or -- ** -- writing is made. 11 bits which made the main scanning direction address generator 62 correspond to 2048 pixels, and the direction address generator 63 of vertical scanning consist of 12 bits made equivalent to 2560 pixels, and also become the same configuration.

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latch circuit 68 +4 which is the increment of the address. And CPU50 sets the read-out flag of the command latch in the frame memory timing control circuit 61, and the direction addition flag of X, and orders it initiation of data transfer.
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[0033] Although the image data read from the frame memory 52 is transmitted through the I/F logic 77 and the image bus VB, in CPU50, it is carrying out transmission control of it one line at a time, and if the transfer to the magnetic-disk control section 57 is needed during a transfer to display and control section 51a, it will store this address at the time at the time of transfer termination of this Rhine, and transmits by setting up the address of the frame memory which should be transmitted to the magnetic-disk control section 57, and a delta value and a command. And the address which it is at the transfer termination time and was being stored, an increment, a command, etc. are reset, and the transfer to display and control section 51a is resumed. Although the overhead in a latch or a setup to a register exists and this reduces effective speed, compared with an image transfer, frequency is very low, and it enables juxtaposition actuation seemingly.
[0034] moreover, under reading actuation -- the frame memory 52 from the control circuit 47 of the radiation image information record read station 24 -- display and control section 51from frame memory 52 a -- or the magnetic-disk control section 57 -- ** -- although the transfer to say is performed for above-mentioned business in juxtaposition, the data storage to a display for the image display means 51 and a magnetic disk drive 58 is mostly made by coincidence with reading termination.
[0035] And at the time of reading termination, CPU50 sets a start address as a latch circuit 65 and a latch circuit 66, sets +32 as a latch circuit 67 and a latch circuit 68, and transmits to the buffer memory in the magnetic-disk control section 57. The number of pixels at this time becomes 64*64 pixels a total of 4096 pixels. This becomes the form which the main-sub scan performed pixel infanticide to 1/32, and trimmed the image for the square. Using this image data, CPU50 searches for the accumulation frequency distribution of an image, searches for the image-processing conditions which are the optimal display property of an image, and changes the contents of the look-up table for a display in display and control section 51a. Thus, this invention person finds out that change hardly breaks out with image data with original characteristic quantity and accumulation frequency distribution, such as ** which thins out and (a pixel number is 1/1024) makes a main-sub scan 1/32, maximum which an image has, the minimum value, and the median, an operation is extremely simplified by using this phenomenon, and it enables it to judge even a 16-bit microprocessor that there is almost no time lag in acquiring the optimal display property of an image. Drawing 6 (A) thru/or drawing 9 (H) illustrate the accumulation frequency distribution and the frequency distribution property in each rate of infanticide. Even if the accumulation frequency distribution (drawing 8 (F)) thinned out every 32 pixels even if it compared with the accumulation frequency distribution (drawing 6 (A)) of original image data as I understood also by this example is carrying out the same configuration and presumes an image condition using this, it is almost satisfactory. Moreover, even if it uses the image of the rate of infanticide beyond this (drawing 9 (G), (H)), since the

presumption is seldom out of order, it is effective also in processing time also in hard.
[0036] And if it is drawing 7 (D) and drawing 8 (E) extent, it is possible to perform not to become so big the processing time, even if it uses 16-bit CPU, but to presume using original image data, and processing which is not inferiority, and it is effective.
[0037] In addition, an X-ray picture has that it spoils [little] the description even if the information on an image periphery has low effect to the whole and excludes and extracts the upper part and the lower part as an extract field of an image. Reading control of only the center section in such a case, and when a reading image becomes fairly smaller than 2048*2560 pixels, the rate of infanticide is made as small as 31, 30, and ..., it thins out with a reading field, such as reading within the limits of an image field, and proper adjustment of a rate can be easily performed by modification of latch data.
[0038] As an example, when reading the image of 2048 pixels of horizontal scanning, and 2464 pixels of vertical scanning, 64*64-pixel extract data can be obtained for the 2048*2048-pixel image which excluded the upper part and the lower part of 208 lines at a time, respectively by 1/32 of pixel infanticide. An extract can be completed before 200 lines or more which reading ends, and this can calculate accumulation frequency distribution after that, can compute maximum, the minimum value, the median, etc., and can terminate all operations before ** which creates look-up table data with the optimal property for the image which is image-processing conditions, and reading termination. This means enabling observation of a CRT image in reading termination and the almost optimal display property for coincidence, if the look-up table for a display in display and control section 51a is changed.
[0039] Drawing 2 shows the block diagram of display and control section 51a. The image data which let the image bus VB pass is written in the memory 81 for a sequential display through a data buffer 80. This memory 81 for a display has the storage capacity for 512*640 pixels for 10 bit data. A sequential transfer is carried out at the look-up table 82 for a display which changes 10 bits (1024 level) data into 8 bits, conversion compression of the stored data of the memory 81 for a display is carried out at 8-bit data, and this data is changed into analog data with D/A converter 83, is further amplified and video-signal-ized for CRT with amplifier 84, and is given to a CRT display machine. Write-in read-out control according [the memory 81 for a display] to the memory control circuit 85 is made, and the display control of the whole, such as data transfer control and generation of a synchronizing signal, is made by the display-control circuit 86. It gives through a system bus SB and the I/F logic 87 from CPU50, and the command for these control is ******.
[0040] The display control of such a configuration is explained below. The display changes with rewriting control of the look-up table 82 for a display by CPU50 at the time. Then, CPU50 eliminates the image currently displayed on the display-control circuit 86 till then by giving clear command at the time of photography initiation. This uses a dual port RAM as memory 81 for a display, and can end it by one-frame display time by writing in black data from a read-out port side. Here, in case the memory 81 for a display is eliminated, linearity table data are written in the look-up table 82 for a display. This makes it possible to catch a gap of a camera station and near sensibility of image data by enabling observation of the whole region of image data at the display under reading. For example, although the range of triple figures of X dosage is quantized to 10 bits and digital image data are obtained in the radiation image information record read station 24, the actually effective range is about 1.5 figures, and image data enables it to observe by CRT in which hit of the level of 10 bits (0-1023) it exists. The check of whether the image is located white and near the black level by the setting mistake of photography conditions from this observation is enabled, and it enables it to judge immediately whether re-photography is needed.
[0041] By processing extract image data according to image-processing conditions, the display image of CRT changes to an image with reading termination and the almost suitable gradation for coincidence, and is used as the good image of diagnosis nature. At this time, when the irradiation field and photography conditions of photography differ from usual greatly, it may not become the image it is satisfied with the gradation property set up beforehand of an image enough. In this case, it can respond by changing gradation by scanning the function key for gradation control of keyboard 53a. That is, since the gamma value which is the concentration and the inclination of an image is important for an X-ray picture, image-processing conditions are amended in digital one by changing the two parameters by the look-up table 82 for a display which are image-processing conditions. From the thing to the above, an image check is immediately enabled after photography and the image which moreover has desired gradation nature is made observable.
[0042] Moreover, when observing an image even into details, expansion of keyboard 53a and the function key for

panning also enable it to perform expansion and panning of an image. Expansion of an image is possible by reducing the rate of infanticide and transmitting to the memory 81 for a display from a frame memory, and panning is realized because only the amount to which an image is moved transmits only the image of the part which shifts the read-out starting address of the memory 81 for a display, and appears in CRT newly. In order to enable this control, the memory 81 for a display is constituted so that a main scanning direction and the direction of vertical scanning may serve as endless.

[0043] Furthermore, while the image is carrying out right-and-left reversal by the photography approach, it can correct by performing right-and-left reversal of an image with the function key for right-and-left reversal. Moreover, when a photographic subject name, a birth date, etc. have an input mistake, it becomes correctable by the keyboard. Although it moves to the next photography when the above checks are completed, all data are decided at this time and the transfer to an external instrument is attained. Moreover, there is no next photography and automatic transfer to an external instrument can also be made possible by making data decide automatically after fixed time amount progress to which an operator will not operate it.

[0044] In the case of the microfilm duplicator which the case of the host computer of a high order also has and records an image, it is possible for an above-mentioned external instrument to make it both further. Among these, when making it a host computer, it realizes by making image data into every two or more lines 1 block, transmitting to the buffer memory under interface for external instruments via the image bus VB, if it reads from the magnetic-disk control section 57, and transmitting to a host computer. Moreover, CPU50 sets up the look-up table under interface first, and is made similar to the image observed by CRT in the case of a microfilm duplicator. And it is made to print by performing an image transfer. That is, CRT has composition which is outputted and can display the image corresponding to the image by which image recording is carried out.

[0045] In addition, even if it uses an external instrument as a host computer and makes it a microfilm duplicator, to becoming a high-speed processor, execution speed may be reduced greatly or it may not be of use for a transfer to transmit image data with read-out from a magnetic disk drive 58. On this problem, a frame memory 52 can be extended by further 1 screen, and improvement in execution speed can be aimed at by carrying out change-over use the object for reading, and for a transfer on it. Moreover, about the image which carried out transfer termination to the external instrument, the management information of a magnetic disk drive 58 can be deleted, and it can prevent this magnetic disk drive 58 overflowing.

[0046]

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the control circuit Fig. of the frame memory in this invention.
[Drawing 2] It is a display-control circuit diagram in this invention.
[Drawing 3] It is the equipment configuration Fig. of a radiation image information reader.
[Drawing 4] It is the block diagram of the timing control in the control section.
[Drawing 5] It is the configuration schematic diagram of a frame memory.
[Drawing 6] (A) and (B) are the measurement Figs. showing change of the histogram to the rate of thinning out of image data.
[Drawing 7] (C) and (D) are the measurement Figs. showing change of the histogram to the rate of thinning out of image data.
[Drawing 8] (E) and (F) are the measurement Figs. showing change of the histogram to the rate of thinning out of image data.
[Drawing 9] (G) and (H) are the measurement Figs. showing change of the histogram to the rate of thinning out of image data.
[Description of Notations]
21 Radiation Source
22 Photographic Subject
23 Conversion Panel
24 Radiation Image Information Record Read Station
25 Control Section
51a Display and control section
52 Hurrah MUMEMORI
52a Frame memory control section
61 Frame Memory Timing Control Circuit
62 Main Scanning Direction Address Generator
63 The Direction Address Generator of Vertical Scanning
81 Memory for Display
82 Look-up Table for Display

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

WRITTEN AMENDMENT

---------- [a procedure revision]
[Filing Date] June 25, Heisei 9
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] It is the radiation image information reader which reads the radiation image transformation panel by which the radiation image was recorded, and obtains image data,
A reading means to read the radiation image transformation panel by which the radiation image was recorded, and to obtain image data,
A receiving means to receive the photographic subject information inputted from the external terminal,
It has a collating means to collate the photographic subject information received with said receiving means, and a photographic subject,
The radiation image information reader characterized by constituting so that the radiation image transformation panel by which the radiation image of said photographic subject was recorded may be read and image data may be obtained, after completing collating with said photographic subject information and photographic subject.
[Claim 2] A radiation image information reading means to read the radiation image transformation panel by which the radiation image was recorded, and to obtain image data,
A display means to display the image based on said image data according to reading of said radiation image,
A means to calculate the image-processing conditions according to said radiation image from the characteristic quantity of said image data,
A modification means to change the image displayed on said display means based on said processing conditions,
The radiation image information reading display which has a means to amend said image-processing conditions.
[Claim 3] It is the radiation image information reader which reads the radiation image transformation panel by which the radiation image was recorded, obtains image data, and performs an image processing to this image data,
A reading means to read the radiation image transformation panel by which the radiation image was recorded, and to obtain image data,
A means to thin out and thin out said image data and to acquire image data,
A means to search for the image-processing conditions according to said radiation image based on said infanticide image data,
The radiation image information reading display which has an image-processing means to process said image data based on said image-processing conditions.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0018
[Method of Amendment] Modification

[Proposed Amendment]
[0018] In case the purpose of this invention searches for the image-processing conditions according to a radiation image after photoing a radiation image on a radiation image transformation panel, it is using or enabling modification of this processing condition of infanticide image data, and is to offer the radiation image information reader which can obtain the high image data of a sex or diagnosis nature instancy. Moreover, it is in offering the radiation image information reader which enabled it to relieve photography and a read mistake by performing correlation with photographic subject information and a photographic subject.
[Procedure amendment 3]
[Document to be Amended] Specification
[Item(s) to be Amended] 0019
[Method of Amendment] Modification
[Proposed Amendment]
[0019]
[Means for Solving the Problem] It is this invention in order to attain the above-mentioned purpose,
1) A reading means to read the radiation image transformation panel by which it is the radiation image information reader which reads the radiation image transformation panel by which the radiation image was recorded, and obtains image data, and the radiation image was recorded, and to obtain image data, It has a collating means to collate a receiving means to receive the photographic subject information inputted from the external terminal, and the photographic subject information received with said receiving means and a photographic subject. The radiation image information reader characterized by constituting so that the radiation image transformation panel by which the radiation image of said photographic subject was recorded may be read and image data may be obtained, after completing collating with said photographic subject information and photographic subject,
2) A radiation image information reading means to read the radiation image transformation panel by which the radiation image was recorded, and to obtain image data, A display means to display the image based on said image data according to reading of said radiation image, The radiation image information reading display which has a means to calculate the image-processing conditions according to said radiation image from the characteristic quantity of said image data, a modification means to change the image displayed on said display means based on said processing conditions, and a means to amend said image-processing conditions,
3) Read the radiation image transformation panel by which the radiation image was recorded, and obtain image data. A reading means to read the radiation image transformation panel by which it is the radiation image information reader which performs an image processing to this image data, and the radiation image was recorded, and to obtain image data, A means to thin out and thin out said image data and to acquire image data, and a means to search for the image-processing conditions according to said radiation image based on said infanticide image data, The radiation image information reading display which has an image-processing means to process said image data based on said image-processing conditions is proposed.
[Procedure amendment 4]
[Document to be Amended] Specification
[Item(s) to be Amended] 0023
[Method of Amendment] Modification
[Proposed Amendment]
[0023] Actuation of such equipment is explained below. The identification information of the photographic subject 22 by which roentgenography is carried out is inputted from keyboard 53a of the control section 25. As this identification information, there are an ID number, a name, a birth date, sex, a photography part, photography time, etc. However, photography time may be made to be inserted with the calender clock built in in CPU50 automatically, and when ID information is managed with the external instrument, I have it spent and it may be made to perform only collating. Moreover, you may only collate by receiving what was inputted at the external terminal. moreover, the thing about the patient by whom the identification information inputted here is photoed at the time -- good -- it carries out, a series of information is inputted beforehand, and a photograph may be taken in order behind. Identification information is inputted and a photograph is taken by setting a photographic subject 22 to a camera station. If a photography carbon button is pushed, CPU50 directs reading initiation to reading control-section 54a. Reading control-section 54a controls the drive circuit 10 via X-ray adapter 54b, and directs roentgenography to the radiation source 21. The radiation source

21 irradiates a radiation (X-ray) towards a photographic subject 22 by this. This radiation penetrates a photographic subject 22, the energy according to the rate distribution of a radioparency of a photographic subject 22 is accumulated in the photostimulated luminescence body whorl of the radiation conversion panel 23, and the latent image of a photographic subject 22 is formed there. Roentgenography is completed by the above.

[Translation done.]